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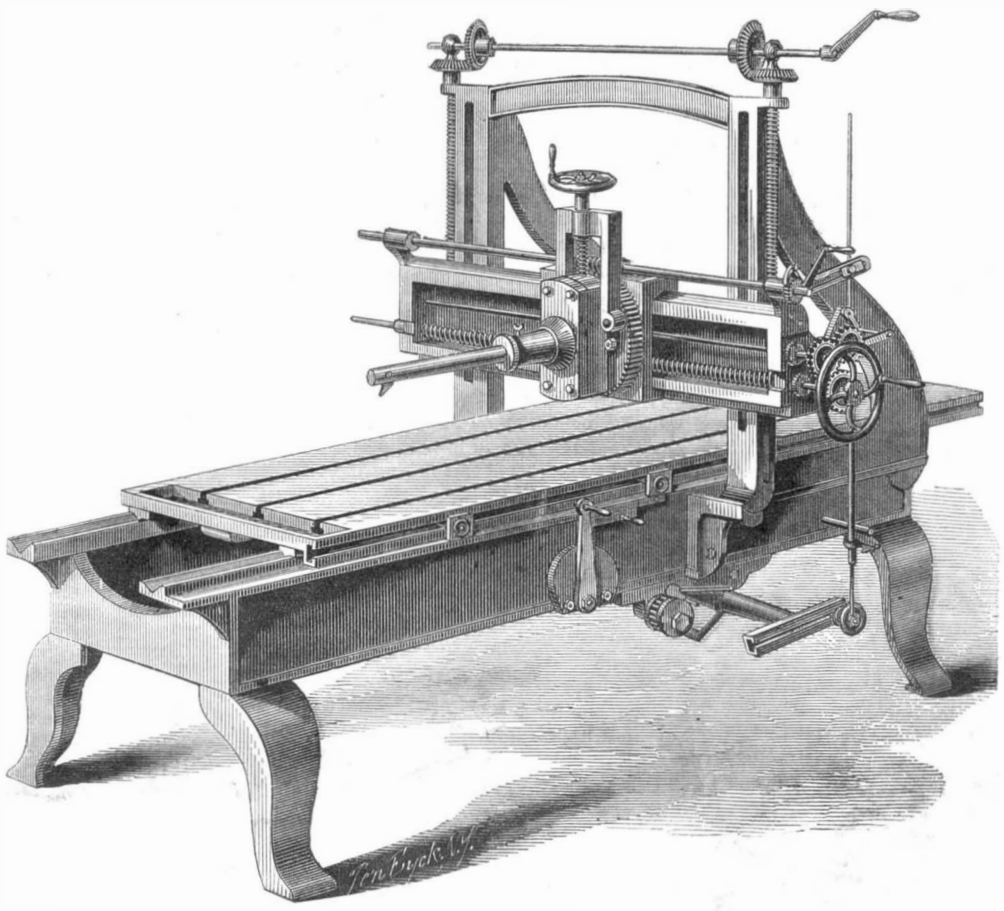
Improvement on Iron Planers.

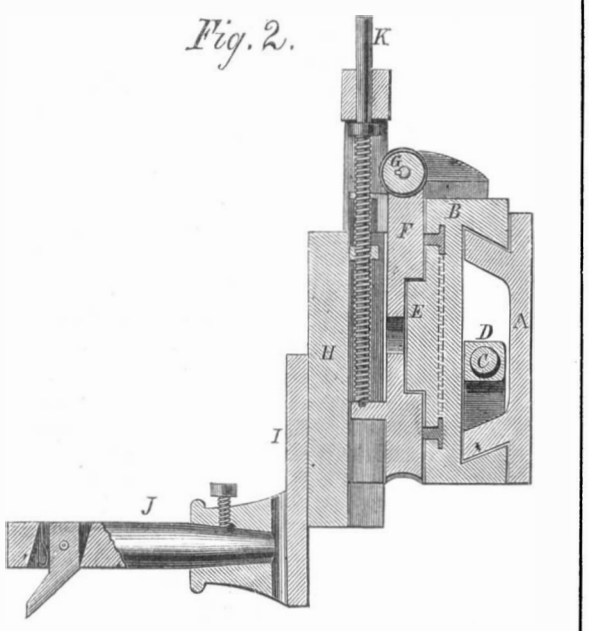
The hand planer and shaping machine are often used instead of the power planer, because the latter could not be easily adapted to the style of work desired when the surface to be planed was angular, slashed, or of a partially circular form. The attempt of the inventor of the improvement intended to be represented in the accompanying engravings, is to adapt the ordinary planer to a class of work now generally done on the hand planer, slotter, and shaping machine. It is of such a character as to be readily attached to any planer, and in no wise impairs its normal efficiency. It is the invention of Charles A. Meinhard, of Fort Wayne, Ind., and was patented through the Scientific American Patent Agency, Nov. 26, 1867.

In addition to the work usually performed by the ordinary planer, this appurtenance will enable the operator to work on angular and curved surfaces, or to cut the slots and keyways in taps, reamers, shafts, or pulleys, and other useful adaptations will suggest themselves to the practical mechanic.

Fig. 1 is a perspective view of the planer having this attachment; Fig. 2 being a section of the head and its appurtenances. The letters refer to the latter alone, as their connection with the main figure can easily be traced. A is a frame on which slides the head, B, having dovetailed lips fitting corresponding surfaces on the frame, A. This head, with its connections, is moved transversely across the bed of the planer on the frame, by the screw, C, which works in a nut, D, formed on the inner side of the head, B, so that by turning the screw, C, the head, B, can be worked transversely across the planer as with the ordinary head. On the outer side of the head or plate, B, is formed a circular T-shaped groove, and concentric with it is a circular projection, E. F is a solid worm wheel, having a recess on its inner face, fitting the projection, E, and held by bolts with T-shaped heads fitting the circular groove in B. The shaft, G, which passes, like the screw, C, across the frame, is slotted or grooved from end to end, and carries a worm engaging with the worm wheel, F, and turning with the shaft, G, by means of a fixed feather, key, or pin. It is kept in contact with the teeth of the worm wheel by projecting ears on B. On the face of the worm wheel is a dovetail tenon upon which a correspondingly grooved plate, H, slides. To this plate is bolted the tool holder, I, and a screw, K, serves to elevate or depress the planing or slotting tool by means of the plate, H. The cylindrical



MEINHARD'S COMBINED PLANER AND SLOTTING MACHINE.



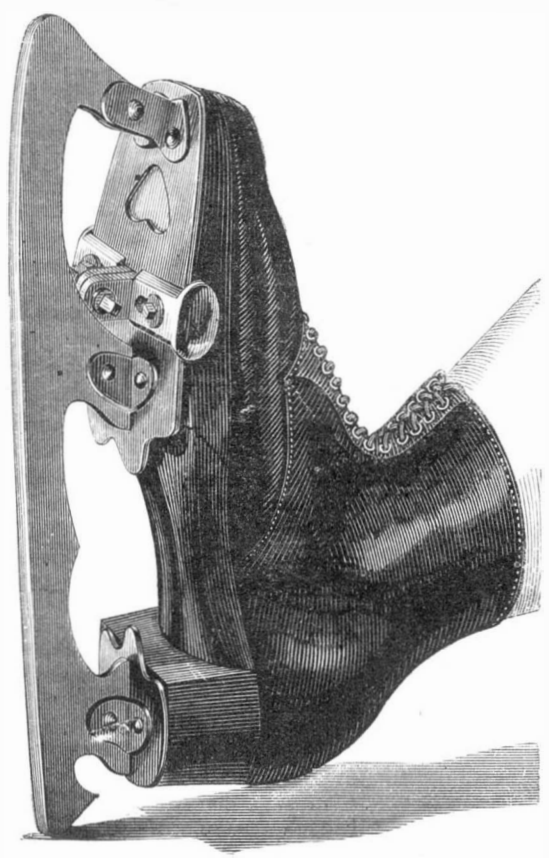
tool holder, J, holds the cutter, which is pivoted in a slot and is held in position by a light spring which allows it on the return stroke, to ride over obstacles, but returns it to place on the forward movement.

It is evident to the practical mechanic that not only the transverse movement of the cutter head can be controlled by an automatic feed, but that the position of the tool to necessary angles or curvatures can be similarly controlled; so that a planer, with this device attached, may by used to plane around surfaces which present a form varying from the level. The tool-holding plate, I, may be at any time removed and another substituted to suit any syle of work. As every practical machinist will readily understand the object and construction of this planer, from the engravings, it will not be necessary to give a more detailed description.

Further information, however, in regard, to rights may be obtained of the patentee, Charles A. Meinhard, Fort Wayne, Ind.

SMITH'S NEW YORK CLUB SKATE.

Skating has become a popular amusement for young and old of both sexes, and is generally recommended as healthful and invigorating. Consequently, the manufacture of skates



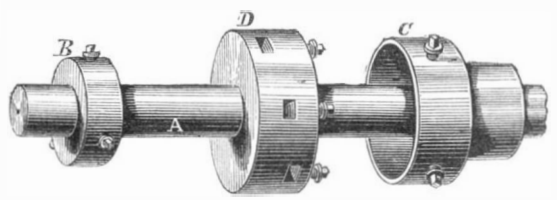
in this country has, within a few years, assumed va tions, and the skate itself has been greatly improved in material, form, and convenience. Those now generally used are very much lighter than those formerly imported from Europe, the wooden stock being replaced by plates of thin sheet steel and in some the straps and buckles being dispensed with. Such is the character of the skate shown in the engraving, the adopted skate of the New York Club, and deservedly popular in New York and other localities. It is made entirely of metal, the runner and plates being of steel and the clasps of steel, white metal, or brass, silver plated, the latter making an elegant contrast with the other portions. The bottom of the runner is curved in the "rocker" style, but having the full toe and long heel, which, while they give sufficient security to the beginner, supporting the body in all po sitions, permit backward skating and all other movements desired by the accomplished skater.

The heel fastening is a square plate recessed into the boot heel and held by four screws. In the center is an elliptical hole which receives a similarly shaped button projecting from the heel plate of the skate This is inserted with the skate at right angles to the foot, and the skate being swung round under the foot, the heel is secured. The front plate is fastened to the sole of the boot by two sliding jaws, the inner face of the projections being serrated to grasp and hold firmly to the edges of the sole. They pass under the front plate, to which they are secured by set screws passing through slots, by which the skate can be adjusted to the width of the foot and be fixed in the center or on one side, as may be desired. The edges of the clamps are so formed as to receive and support the weight of the body when, in describing very large circles in fancy skating, the skate iron is at too great an angle to be depended upon. A horizontal screw, passing through ears on the clasps, draws them together. By means of a key, or wrench, the skate may be put on or taken off in a few seconds. There being no straps, strings, nor buckles, the circulation of the blood is not impeded and the foot is not cramped.

The skate is neat, elegant, convenient, and strong, and in practice we have found it all that could be desired. It is made of the best materials and in a workmanlike manner. The letters patent, granted through the Scientific American Patent Agency to O. G. Brady, date Sept. 23, 1862, and the reissue, to Phineas Smith, Dec. 24, 1867. For rights, etc., address the manufacturer, Phineas Smith, 25 Cliff street, New York city.

BORING OF CYLINDERS ON A LATHE.

We have published two engravings with descriptions—one on page 408, Vol. XVII., and the other on page 52, Vol. XVIII.—on the securing of cutters in boring bars. Both of them must recommend themselves to practical machinists as possessing real advantages over the plans ordinarily employed. They are from correspondents who are evidently practical mechanics, and who know their business. We think, however, that some additional information, not afforded in our



correspondents' letters, in regard to the boring of cylinders may be of use to our mechanics, and offer the following description of a method of boring cylinders on lathes, which we used with success some fourteen years ago, believing it at the time to be original, and not since having seen it in operation in any other shop. Others, however, may have conceived the idea and used the apparatus:

The usual method, when a cylinder has to be bored by a horizontal bar on a lathe, is to "block up" the cylinder, one end resting on the lathe carriage and the other on a temporary support of wood, the cylinder being "shimmed up" with wedges and other temporary contrivances, and secured to place by bolts and nuts. Every machinist knows that such a

cise of patience, and provokes a disposition to profanity. If one end of the cylinder is brought to the proper level and trued to the cutters, the other is almost certain to be "out," either in one or the other direction.

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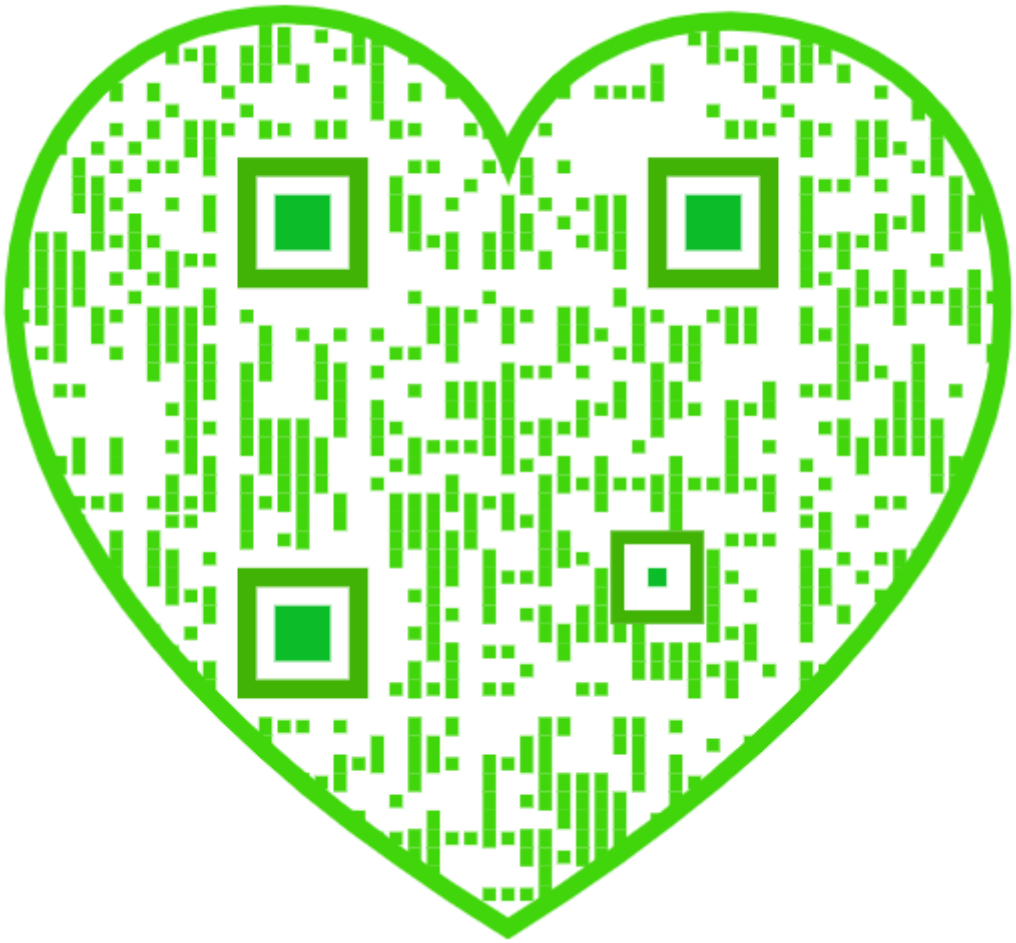

Our plan is to hang the cylinder on the boring bar itself, making its center the center of the cylinder, the whole being sustained by the centers of the two spindles in the lathe heads. If the cylinder—whether an engine cylinder or a pump tube—is heavy (and this depends mainly on its diameter), the stock of the boring bar, with its proportions as to length, etc., must conform to the work to be done. There is no blocking or shimming up to be done, and no bolts are required.

The accompanying engraving shows a boring bar, A, of suitable diameter and length, turned and finished from end to end. Bored and reamed to fit are two disks, B and C, which may slide on the bar freely. D is a cutter head secured to the bar by key or set screw, having cored apertures, one, three, five, or more in number, to receive the cutters, which are held by set screws, as seen. Each of the cutters is slightly receded from the other as regards its position relative to the face of the cutter head, or disk. This arrangement every machinist will understand as calculated to allow of roughing and finishing cutters acting one after the other.

The disk marked B is intended to go inside the cylinder, the set screws—the top of heads of which are slightly convex—engaging with the inside surface of the cylinder. The dished disk, C, is intended to pass over the end of a cylinder too small in diameter to receive the disk, B, inside, and set screws, passing through its rim, fasten on the outside of the cylinder. It is provided with a long hub to give sufficient bearing. This disked disk is not necessary to be used in connection with the other, except where, as in iron pumps for ships, one end of the cylinder is much smaller than the other.

The disks, B and C, slide on the boring bar, and are thus a part of the cylinder. To prevent the entrance of borings and dust between the outside surface of the bar and the inside of the sliding disks, a gland of leather or india rubber is passed over the boring bar on the advancing side of the disks. In boring engine cylinders the disks may be dispensed with, and heads be bolted on the ends of the cylinder, the faces of which having been previously turned.

Improvement in the Manufacture of Iron.

This is a recent patent by David Stewart, of Kittaning, Pa., who says:—

"My invention consists in an improved method of treating iron as it comes from the blast furnace, or remelted pig iron, to remove therefrom the carbon, silica, sulphur, phosphorus, and other impurities which are found in the iron, and which are not removed from or have been contracted by the iron by the process of reduction from the ore.

"It is well known that pig iron, or iron from the blast furnace, contains a large amount of carbon, which it receives in the process of reduction, and which must be more or less completely removed in order to produce wrought iron or steel. Carbon has a great affinity for oxygen, greater than either carbon or oxygen have for iron, and as the union of carbon and oxygen, at a sufficient temperature to produce combustion, evolves a great amount of heat, it follows that by mixing oxygen with molten pig iron, the carbon ignites with vivid combustion, and is thereby eliminated, while the increase of heat thereby obtained renders the iron more fluid, and obviates the necessity of using other fuel or fire than is furnished by the carbon contained in the molten iron.

"The most approved mode of accomplishing this object, heretofore introduced into practice, is to pour the melted metal from the blast furnace into a receiver or vessel through which a stream of atmospheric air is forced at sufficient pressure. This, known as the pneumatic process, is attended with the use of very expensive apparatus and machinery, and, moreover, requires to be closely watched, as the operation, if continued too long, injures the metal; besides, it is not effectual in removing the impurities other than carbon, such as silicon, sulphur, phosphorus, etc.; and even as respects the removal of the carbon, its operation is not always satisfactory, as it is difficult to secure the equal action of the oxygen on all the particles of iron in the receiver. My improvement produces a much more satisfactory result, with little or no special apparatus, and produces immediately from the molten pig metal wrought iron, which may be at once taken to the rolls and worked in like manner as iron which has been puddled and squeezed.

"My improvement consists in subjecting molten pig metal or iron direct from the blast furnace to the action of oxygen (in any convenient shape, as atmospheric air, ozone, or other vapor or gas containing oxygen), by passing the molten metal in a stream or shower, either poured or forced upwards or sideways, so as to secure an intimate admixture of the particles of iron with the oxygen, or other oxygen-bearing gas or vapor. In order to carry this into effect, no special apparatus is required; indeed, each manufacturer will probably vary the arrangement of his furnace to suit the mode of accomplishing the desired result which will best suit his convenience or the requirements of his business.

"The melted iron may be run directly out of the tap hole of the blast furnace, or may be first poured out into a pot. It is then allowed to run from an elevation of thirty feet, more or less, to the ground, and by this means the iron is brought into intimate contact with the air, so that the carbon is rapidly ignited, increasing the temperature of the metal and its fluidity, and, at the same time, carrying off in a great measure the other impurities, such as silicon, sulphur, and phosphorus, which also ignite with the carbon and are thus eliminated. If it is desired to prevent the metal becoming spattered around as it falls, when it reaches the ground, it may be poured through a pipe, cylinder, or tube, open at both ends, so as to permit the free passage of the air upwards through the cylinder. This plan has the advantage of securing a more uniform current of air, which will flow upwards through the cylinder, in consequence of the rarefaction caused by the heat of the metal. A stream or current of atmospheric air, either hot or cold, or of ozone, or steam, or a mixture of any of the gases or vapors, singly or combined, may be introduced into the cylinder, pipe, or tube, through which the metal is poured; and, if desired, pressure may be applied so as to create a stronger current or blast up through the cylinder. If it is desired to add any fluxes to the iron (or physic it, as the iron workers term it), this may be done before the iron is poured out. The hight from which the metal is caused to fall may be varied according to the quality of the metal, and also somewhat according to its quantity, as the more impure the iron, the greater the hight from which it should fall, the consequent distance through which it should be exposed to the action of the air or other oxygen-bearing gas or vapor, and the larger the quantity, the greater the hight should be so as to secure the more complete action on the particles of iron. A more complete separation of the particles of metal may be secured by pouring it through holes or perforations in a plate or otherwise. Instead of pouring the metal downwards, the same result would be produced by an upward jet; but the plan above indicated, it is believed, will be found the best and simplest in practice.

"By the means above described, of pouring molten pig metal through a cylinder thirty feet high, I have produced iron which, when heated and passed through the squeezers, gave out no cinder, thus showing that the silica had been nearly, if not entirely removed, and from which, in the condition in which it passed from the muck-bar rolls, it was ready to be worked for any desired purpose. So that by my process, wrought iron ready for the rolls is produced directly from pig iron by a process requiring little or no machinery or apparatus, and scarcely any time, and dispensing with the ordinary troublesome and tedious processes.

"I also apply the above mode of purifying iron to the manufacture of semi-steel and steel, the process being the same, though a more perfect and longer continued admixture of air or other oxygen-bearing gas may be required therefor; and such application I include in my invention.

"I do not claim the use of steam in the above process. What I claim as my invention is—

"Purifying pig iron or blast furnace metal from its carbon and other impurities by passing it in a stream through ozone, atmospheric air, or other oxygen-bearing gas or vapor, substantially as and for the purposes hereinbefore described."

MANUFACTURE OF SOAPS.

TOILET SOAP.

Under this denomination a soap is classed which is distinguished by its fine appearance, agreeable odor, and the small quantity of lye it contains, from all other household and washing soaps. It is presented to the purchaser enclosed in every sort of envelope, embellished to catch the eye, or packed in boxes.

Three sorts of this toilet soap are known; namely, that from pure cocoanut oil, from tallow and cocoanut oil, or from hog's lard: however, these sorts differ from each other, both as to the proportions of lye and the manipulation.

Among all the toilet soaps found generally in commerce at present, that from the cocoanut is most in demand, as cold water is generally made use of for washing. This cocoanut soap froths equally well in cold as in warm water, which is not the case with tallow soap worked with soda. Besides this, cocoanut oil is very suitable for a toilet soap, producing a fine white color, and when dyed red has a very alluring appearance.

The lye fit for toilet soap must be either made from the purest German soda at ninety-five degrees of strength, or (which is better for the purpose) from crystallized soda. English soda of eighty to eighty-three degrees, such as is generally found in commerce, is not to be used, as it produces a bad article.

The best soda at ninety-five per cent comes at present from the Baron von Landsberg Velim's chemical works at Schloss Wocklum, near Iserlohn, and delivered free at Cologne, at $\frac{16}{3}$ per cwt., whereas the English soda at eighty-five per cent costs $\frac{15}{6}$ per cwt.

When the lye for finer soap is to be made, a hundred pounds of lime are added to a hundred pounds German soda at ninety-five per cent, whereas forty-five pounds lime to a hundred pounds crystallized soda is the general proportion.

The soda is dissolved in the boiler with water, or with a weak lye remaining from a former operation at twenty degrees of strength, and afterwards added to the lime slacked to a state like broth. This mixture must boil two hours and be left to deposit.

The next day, the lye, which probably may be at twelve degrees, must be taken out, and the boiler filled afresh. The lye drawn from the lime and at eight degrees, is poured in with it to evaporate. By this method a lye is produced at a medium of nine or ten degrees, but it must be evaporated till according to the lye scales it shows thirty-four degrees. After the cooling it will weigh thirty-six pounds. This evaporation of the lye is to increase its causticity, and to cause all the dirt contained in it to precipitate to the bottom, which can be done in a day if it is sufficiently strong.

The clear lye is then drawn off from the dirty deposit, and put either into vitriol bottles or into an iron vessel well covered. If vitriol bottles are used, they must be filled with water in which some lime has been dissolved, to take away any acid remaining in the bottle, which would, if this precaution be not taken, absorb much of the causticity of the lye, and this must be done several days before using the bottles. The dirt and deposit from the salt remaining at the bottom after the boiling, can be added to the lime in the weak lyes.

We have not made the experiment of using the lye stronger than eleven degrees before the evaporation, as we have learned from France that it must not be stronger than eleven degrees. Yet, after mature experience, it appears to us now that a lye can be obtained quite as good by adding more soda and lime to the lye, and thus increasing the strength to eighteen or twenty degrees, by which the evaporation is spared. In this case more vessels are wanted, which must not be of wood but of iron, because the wood will color the lye, which must be especially avoided for fine soap, for the only means of obtaining a perfect soap free from defect, is to use none except the finest and whitest lye, and oil or grease of the greatest purity.

If the clearness be an indispensable requisite for this lye, it must be much more so for the oil or grease to be employed, the proportion of which is so much greater than the lye.

The cocoanut oil to be used for this soap must be of the best quality of Ceylon oil, which is dazzling white, of an agreeable odor, and without the slightest acid. If it has a strong odor, then it is a bad oil, and will produce a soap of a strong and disagreeable smell. Before purchasing a considerable quantity, it is better to have some samples from different casks brought in order to choose the best.

For making fine soap, low forms of wood are required, holding seventy-five to eighty pounds of soap, six inches high, two and a half feet long by one and a half in breadth, with a cover of wood exactly fitting the form, so that the soap will be brought to the same level, and nothing lost by its obliquity; further, a small iron boiler is needed, holding ninety to a hundred pounds of soap, standing on an iron circle with legs, in which boiler the soap can be stirred more conveniently.

TRANSPARENT SOAP.

For this soap a small still, such as distillers use, with a cover and a serpent, is wanted. This still with its serpent must stand in another boiler, in which it is heated either with boiling water or by steam, and besides, some tallow soap ready boiled and unsalted is wanted, and some spirit of wine not smelling of bad brandy.

The tallow soap must be cut in small pieces, and put into the boiler with the spirit, in the proportion of ten of spirit to ten pounds of tallow, and the cover put on, with the serpent communicating through, and carefully pasted round with dough, so that no steam may escape. The fire is then made under the boiler, and the soap with the spirit brought to boil. As soon as the heat is felt in the mass, the spirit will begin to evaporate through the serpent; but as it has to pass through cold water, it will not be the steam which escapes, but the pure spirit, which will flow into a vase placed under the serpent. As soon as this escape of the spirit commences, the heat must be brought on slowly, to prevent a strong ebullition, which would cause the soap to come to the surface, and seek to escape through the serpent. If, notwithstanding, the soap still stick to the serpent, there is no other way to obviate it than by pouring hot water through the serpent, but which will certainly stop the boiling.

When ten pounds of spirit have been used, five pounds only must escape through the serpent, and therefore there will be five pounds left with the soap. The soap is then finished, and the cover must be taken off, and the soap poured into a tin chest to cool it. Before it is cold, a little oil of cinnamon of cloves must be given to perfume it, and if it is to be dyed, some root of alcana is used for red, and gallnut for brown.

The next day the soap detaches from the tin chest, and is then to be cut into lengths of one and a half feet, and three and a half inches thick, like the large bricks of soap, and dried in the open air eight or ten days. It is true that it does not dry altogether, but shrinks in the middle, while the edges continue pointed. At the end of ten days it is cut into pieces of the intended weight with iron wire, and these pieces left to cool still another day, and then pressed between two small plates into tablets. If oval shapes are required, as much soap is weighed at once as each requires, and thus placed in the form.

For this kind of soap cocoanut oil must not be used, as it will not produce a fine transparency, neither will tallow soap made with soda be suitable, because when finished such a soap froths badly.

When this transparent soap should be of a clear yellow, there must be no dye added, but it should be left as it is when distilled, suppressing also the oil of cinnamon, which also gives out color; only a few drops of aniseed or lavender should be used to perfume it.

BROWN WINDSOR SOAP.

Under this name there is a soap well known in commerce, and much esteemed for its durability and fine odor, but which is not made by the cold system, like the other toilet soaps, but by boiling and unsalting with grained soap, or from the shavings of perfumed soap, to which only one third of cocoanut oil and two thirds tallow are added. If prepared from grained soap, from eighty to a hundred pounds of the clear of a boiled grain soap must be drawn off, and poured into a small furnace, and thinned with some water, and dyed brown with the proper dye. Care must be taken to stir it well till the soap thickens in the form, to prevent the appearance of white streaks. For that reason, a soap well prepared can only be made use of for this purpose.

If Windsor soap is to be made from shavings, they must first be melted and salt added till the soap separates from the lie, and a good grain appears. The dye is then applied, and the soap poured into the form, and stirred until cold, when it is to be perfumed.

For the perfume, two thirds oil of cinnamon and one third

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oil of cloves are used, to which a little tincture of musk can be added. This tincture is to be bought at every druggist's, ready prepared, but any one can make it by pouring a little spirit on some musk. The cheapest way is to buy the shrivelled pods of musk, and when cut in small pieces, steeped in spirit for a fortnight, which will communicate the odor to it. Much soap perfumed by this method is found in commerce.—*Kurten.*

Progress of Locomotion Since 1834.

When, in 1834 (says the London *Examiner*), the Duke of Wellington despatched Mr. Hudson to Rome to inform Sir Robert Peel that he had been called upon by King William IV. to form a ministry, it was thought a marvel that the messenger was able to complete his journey on the twelfth day after that on which he left London. Bound on an analogous mission, a Mr. Hudson of the present day would give but a poor account of his journey, if he said that he was occupied upon it even a fourth of that time. By the old roads the distance was a little under one thousand three hundred miles. By railway, the distance over Mont Cenis passage of the Alps is one thousand three hundred and fifty-five miles. In 1834 the cost of Mr. Hudson's journey was about £250. Had he occupied eighteen days instead of twelve, and travelled by the ordinary postal conveyances of the period, he would have paid about £30. The first class fare between London and Rome now does not exceed £13.

The traveller who leaves London on any morning, let us say Monday, at half past seven o'clock, can reach Turin, seven hundred and ninety-nine miles, including a sea passage of twenty-two miles and fifty of ordinary road conveyance, across the Mont Cenis, as the chimes of the Duomo are striking the quarter before twelve on Tuesday night. When the Mont Cenis railway is open, the saving in the passage across the mountain will enable him to push on to Florence the same night; but until then he must repose at Turin until a quarter before eight the following morning. Resuming his journey, he will be in the capital of Italy, three hundred and twenty-three miles further south, at eight that evening, and he can start an hour afterwards, for the Eternal City. The distance from Florence to Rome, two hundred and thiry-three miles, can be accomplished in nine hours and twenty minutes, in which are included frontier *visa* both of luggage and of passport. After a break of four hours he may start again for Naples, one hundred and sixty-three miles further than Rome and fifteen hundred and eighteen from London, and here he arrives at 6:30 P. M. on Thursday evening, three days and eleven hours from the time he left home. When the Mont Cenis railway is completed, the time will be shortened by nearly twelve hours.

In 1834 the *Malle Poste* journey from Paris to Marseilles took eighty hours, the roadway being distance five hundred and thirty miles. In 1867 we leave Edinburgh at seven o'clock in the evening, the next evening at six we are in Paris—six hundred and ninety-seven miles—and the following day at noon we are at Marseilles. Yet Edinburgh and Marseilles are one thousand two hundred and thirty-nine miles apart—our pace, including breaks and stops, has been thirty miles an hour while traversing the whole distance; exclusive of the breaks and stops, five-and-thirty.

Roughly estimated, the number of persons who travelled by mail coaches throughout the United Kingdom in 1837, the year before the partial opening of the railways between London, Birmingham, Liverpool and Manchester, was 2,688,000. If to these be added twenty-five per cent, as representing travellers with post horses, in wagons and canal boats, we have a gross total of land and canal travellers of about 3,360,000; or an eigth of the total population of the kingdom at that time. In 1865, the latest year for which the Board of Trade returns have as yet been issued, the number of passengers carried on railways (including an allowance of one hundred journeys for each annual ticket holder), was 261,577,415, more than eight times the total population of the kingdom. The number of persons traveling on public roads to and from railways is believed to be fully as great as it was by roadway conveyances in 1837. In other words, land traveling in the United Kingdom has *de facto* increased nearly ninety fold in eight and twenty years. Comparing the population at the two periods the increase has been sixty-four fold.

In 1865, the number of third class travellers by railway, in England, was 151,416,269. There is something marvellous about the development of this third class traffic. In the seven years between 1859 and 1865, both inclusive, the yearly average increase of first class passengers was 1,494,122; of second class, 3,775,905, but the average yearly increase of the third class was 9,316,432. This increase must, however, be looked at in another way. In the four years, 1858 to 1862, its average was 4,893,310, but the increase of 1863 over 1862 was 15,617,917; of 1864 over 1863, 15,229,183; of 1865 over 1864, 15,114,688.

At the end of 1865 there were 7,414 locomotives in working order, and during that year they ran 139,527,127 miles with trains behind them. They evaporated as much water as would supply both Manchester and Liverpool with thirty gallons per inhabitant for each day in the year. In the generation of steam only they consumed about 2,625,000 tuns of coal.

The progression of the railway system of Great Britain has been as follows: On the 1st of January, 1843, 1,857 miles were open for traffic; at the same date in 1849, they had increased to 5,007 miles; on the 1st of January, 1855, there were 8,054 miles; eight years afterwards, that is, on the 1st of January, 1863, 11,551; that day twelve months they were 12,322; on the 1st of January, 1866, they were 13,289.

The latest statistics show that there are about 53,000 miles of railway in Europe. The following were the lengths open in different countries at the commencement of the present year: The United Kingdom, 13,382; France, 8,989; Prussia, 5,483; the Austrian dominions, including the non-German provinces of Austria, 4,001; Bavaria, 5,208; Saxony, 1,587; Belgium, 1,910; Italy, 3,040; Spain, 3,216; Russia, 2,893; North and South America, 37,886 (of these 32,896 belong to the United States, and about 16,000 miles are in course of construction there); India, 4,070; Australia, 669. Railways are completed for opening all over the world, at the rate of 10,000 miles per annum; thirty-five miles for each working day throughout the year.

Science Familiarly Illustrated.

HEAT AND COLD.

We present for our young readers (and it may be for older readers) a verbatim report of a familiar lecture by Prof. Tyndall on the above subject, illustrated by engravings. It is a subject of great importance and is very imperfectly understood by people generally, although of value to both old and young. The genial style in which the information is given will commend itself to all our readers:

Now, I suppose all of us twenty times a day—perhaps more—make use of the word "I." Every boy here present says, "I eat," "I drink," "I sleep," "I feel;" but perhaps very few boys or girls either ever ask themselves, "Who is this *I* that does all these things?" and if you went to the biggest man in the world, or the greatest philosopher, you would puzzle him exceedingly if you asked him "Who is this *I* that sleeps, and drinks, and eats, and feels?" In fact, philosophers, great as they may be—and great they are—find that there are things altogether beyond their power to understand, and this wonderful human *I* is one of those things. Hence, I do not want you to be able to answer me if I ask, Who is this *I*—what is this *I*—that sleeps, and drinks, and eats, and feels, and makes use of its senses? In fact, as I have said, the best of us know very little about it; but we know a great deal of that peculiar instrument by which the *I* operates upon the world, and by which it understands the things that are going on in the world, and that instrument is the wonderful human body. When we examine that body, looking into its interior parts, we find bones and muscles and tissues of various kinds; and passing through these muscles we find strings of whitish matter—strings going from the spinal marrow, and going from a mass of matter that rests in this wonderful cavity called the head. I say those strings of white matter go through the body, and they are called the *nerves*; and it is by the intervention of these nerves and this wonderful brain that we human beings are able, so to say, to hold converse with the world round about us. Now, these nerves transmit the impressions from without. If I prick my finger a nerve is affected: it is lacerated by the pricking of the pin or the penknife, and that nerve thus lacerated sends intelligence through itself up along the arm to the brain; and until it arrives at the brain you do not feel anything. It travels up to the brain at the rate of about 180 feet in a second. This is one of these wonderful things that have been measured by able men. You do not feel the exact moment your finger is pricked.

Now, what the nerves in all these cases convey to the brain is something in the nature of motion; and in order to enable you to form an idea of this motion I have arranged a little experiment. And here I must call upon that power which every boy and girl here possesses—that wonderful power which is sometimes called "imagination"—the power of picturing things before the mind. I would ask you to picture one of these nerves going through the body to the brain; and I would ask you to figure that nerve burned, we will say. Now, how are you to conceive of this nerve? The nerve is made up of very minute particles to which we give the name of "molecules" or "atoms." They are sometimes called atoms. In fact a molecule is an aggregate of atoms. But what I want you to clearly realize, and which is perfectly in your power to realize, is that these nerves are composed of little particles—(I do not care about the name, whether "atoms" or "molecules"): and if you disturb the end of any nerve—if you burn it—if you prick it—what you do there is that you impart *motion* to the body. This motion runs along the nerve, and when it reaches the brain it declares itself in some form—of pain, or, it may be, of pleasure. Now, how is this done? You may, in fact, consider those nerves to be like the telegraphic wires that go through the streets. You have seen them passing through the air of London; and these telegraphic wires carry messages to and fro through various parts of London. I say, you may consider the nerves as being represented by those telegraphic wires, and you may consider the brain a great central station, so to say, with which the nerves communicate—to which they communicate their messages, and from which they receive their messages. In order to make this plain I have here arranged a little experiment—very simple indeed. You can make it yourselves with the glass balls used in the game of solitaire. You see I have there a series of these balls, and I want to enable you by these balls to conceive how motion is propagated through the nerves. There is nothing shot through the nerves: the motion is communicated from particle to particle. Observe, here. If I take hold of this ball and strike it against the first ball of this series, you will observe what occurs. The motion will be transmitted through all the series of balls. Each ball will take up the motion given to it by the preceding one, and pass it on to its neighbor, and thus the motion will go through the entire series so that the last ball of the series will be the only one affected. Observe how the last ball is detached. There it goes away. The moment I hit this first ball the terminal ball flies off. Now, in some such way—in a way somewhat analogous to this—is motion propagated to the brain. Allow this bell to represent the brain. Now, if we take our series of balls thus, and strike, as I have said, the first ball, the blow will be communicated to the terminal ball, and that, liberated, will strike against the bell. The sound of that bell is something like a signal given in the brain. [The bell was sounded in the manner indicated.] Here you have the motion transmitted from the first ball, and finally the bell is thus affected. In the way somewhat rudely and roughly represented by this experiment the motion is transmitted to the brain, and when it reaches the brain it evidences itself, as I have said, as pleasure or pain, as the case may be.

Now, having exercised your imagination upon those particles which I have called atoms or molecules, I think we may go on to consider the character of this power that we have to deal with in this course of lectures; that is, this thing that we call "heat." Long reflection and many experiments on this important subject have caused men of science—learned men who investigate such things—to the notion that this thing that we call heat is a kind of motion. And now I should like every, even my youngest hearer (and that is a large demand) to figure, by this power of imagination, what I describe. Take any substance,—for instance, this body which I hold in my hand. This, like our nerves, is composed of little particles or atoms. It is not absolutely cold at the present time. Of course it may feel cold to my hand, but it is really not cold. Those particles that I have been speaking of are in a state of motion. Although they are too small to be seen, and although the motion is entirely too small to be seen even by our best microscopes, still we have every reason to believe that the particles of that body at the present time are vibrating. The little particles, remember—(picture them to your mind)—are vibrating to and fro; and the warmer the body is, the more intense is this motion; and, in point of fact, it is this motion of the smallest particles of the body to which, when communicated to the nerves, and through the nerves to the brain, we give the name of heat. Now, although I am dealing with some of the deepest things in science, still I expect all the boys and girls here to clearly figure to their own minds this substance as an assemblage of small particles, and those particles oscillating—vibrating; and the warmth that I feel when I take this in my hand is due to the multitude of these small motions that are going on within the body. Well, now, this motion of the particles of a body can be excited in various ways, and one of the most ordinary ways of exciting it is by friction. If you take, say a flat brass button, in your hand, and if you rub this button upon a surface of wood, as I am doing this which I hold in my hand, very soon, by rubbing this body [a short rod of metal] I make it so hot that I don't like to bear it against the skin of my face. In point of fact, the friction exerted against this substance produces the motion we call heat, and I very nearly burn myself. The rubbing throws the particles into this furious motion. If I place this body, before rubbing it, upon a flat piece of white wax, there it stands; but let me rub the end of the piece of metal for a time, thus, and then place it upon the wax, you observe it runs away; it melts the wax underneath it, and slides down in this way. This body [a similar short rod of metal] which has not been rubbed, will never melt the wax, and there it rests. The sliding of the other piece of metal is due to the heat produced by the friction. And in various other ways heat is produced by friction. For instance, if you take a saw, and pass that saw through wood, if you are careless and do not put grease upon the saw, then there is so much friction that the amount of heat developed in the saw becomes very great indeed. The saw becomes quite hot. And that is the theory and that is the reason why carpenters grease their saws when they use them. They do not want to make heat, for when this friction is overcome you actually *create* heat. Now, the carpenter is not anxious to make heat; he wants to get through the wood, and he wants to get through it with the least possible trouble; and, in consequence, he lessens the heat by putting grease upon the saw; he makes it as smooth as possible.

In this way, then, that is, by means of friction, we can actually generate, produce, create, this thing we call heat—this motion; and that is a very important point. It was thought for a long time impossible that heat could be generated. It was supposed that there was a certain quantity of heat in the universe, and that this was perfectly constant, no change occurring in it; but you see we have simply to produce this motion of the particles, and then that motion we call heat is set up. I have here an experiment that will still further illustrate this. When I was a boy—and I suppose I was like the average of boys—I was very fond of savages, and people of that kind. Now, I should like immensely to be able to transform myself into a New Zealand savage for the next five minutes. If I could do so I should be able to make a very beautiful experiment which it is not now in my power to do, for I am not so clever as those savages. My friend, Sir John Lubbock, who is a very great man on savages, has given me these two sticks. These are the genuine articles, brought from Australia. This stick is made of a particular kind of wood, pithy, and rather soft: and you see there are holes in one of the pieces of wood. This second stick is made of a harder material. Now, one of these native savages takes one stick and places the end of it in one of the holes of the other stick. He then clasps it, thus, and by the friction he uses he causes a little dust, first of all at the end. He works on until that dust takes fire; and then he manages by blowing, and by operating with far more skill than I can bring to bear upon the experiment, to actually produce flame. These are the very articles used by these New Zealand savages when they wish to produce fire by friction.

Well, I can illustrate still further this mode of producing heat. I have here, you see, a hollow tube, A, and I will place

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in this tube a quantity of a certain liqnid which boils a little more readily than water. I might take water, but I will make use of ether for the purpose of making the experiment more rapidly. Now I will try whether I can not boil that liquid by friction. You see after putting the ether into the tube I cork it up thus, and then fix the tube on this instrument which is called a whirling table, and by means of which I can cause the tube of liquid to spin round with great rapidity.

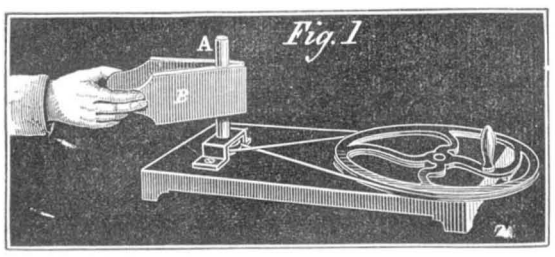

Fig. 1

The tube is now fixed firmly upon the whirling table, and we will there spin it rapidly round and round. I could boil that ether by simply clasping the tube in my naked hand. I have done so over and over again. The friction of my hand against this tube has been sufficient to boil this ether, but I have found it very hot and very unpleasant; and in order to protect my hand I will take a piece of flannel, B, and grasp the tube tightly with the flannel round it. Now, I want you to observe that if the experiment succeeds—(and experiments are always liable to fail)—the friction of the flannel against the tube which goes round and round will cause the ether to boil, and when that happens the steam of the ether underneath the cork will project the cork into the air. I want you now to observe the cork while I clasp the tube in the flannel. [In the course of a few seconds the cork flew from the mouth of the tube.] There it is, you see. Look at that!—boiled in half a minute—boiled by the friction of that piece of flannel against the tube. Well, now, I have here another tube, and I have here a quantity of metal. Look at it,—hard metal. There it is. Now, I break that metal into bits thus; and I purposely avoided putting it into this tube until now so that you might actually see the metal going in, and see that there is no delusion or mistake about the matter. Now, I will place some of this broken metal in this tube. We can put a little more in afterwards. I have put in as much as will go in now. I expect to be able to melt that metal by friction. I will cork the tube up tightly as in the former case, and when the metal is melted I will pour it out on this plate. [The rotation was commenced.] I am beginning to feel the heat now, and I have no doubt that very soon we shall have the metal in the tube molten. [Examines the contents of the tube.] Yes. I will put in more so as to get a greater quantity melted. I will pour it out presently, but you must first exercise your patience until we get it all melted. I put in as much as the cavity would hold in the first instance. Now, we will work the whirling table once more, and I will clasp it as before. [After a further interval]—Now the tube is so hot that I have no doubt the metal inside is melted. Yes, it is melted. Let us put in a last bit, and thus we shall get back the whole of that cake after it has been liquefied by the friction. I cork up the tube in order to keep the molten metal from splashing about. [The tube was caused to revolve again for a short time, and then detached from the whirling table. The metal was poured out, and found to be completely fused.]

Well, there are various other ways by which this motion that we call heat can be generated. It can be generated by percussion—by hitting with anything hard. For instance, I have here a piece of lead—a lead bullet; if I place this bullet upon an anvil, and strike it in this way, when I take it up afterward it is too hot to hold, and burns me. I have actually created that heat. I have called that heat into existence. By hitting this bullet I have thrown its particles into this peculiar vibratory motion to which we give the name of heat.

Now, how do we know the precise amount of heat produced by a stroke of this kind? I had intended to make an experiment before you in connection with this point; but you will understand the experiment without my taking up your time to perform it in your presence. Here is a piece of lead, and there I have upon the floor a thick plate of iron. I intended to send one of my assistants to the top of the house, and I intended him to drop this piece of lead down, and let it fall upon this plate of iron. Now, it so happens that the hight of this room is such that this piece of lead, having a certain amount of temperature on leaving the hand, would have that warmth augmented by one degree of temperature. I must here make use of the term "degree," although I cannot explain it till the second lecture; but you will remember that by the falling of this piece of lead from the ceiling, upon this plate of metal, we should raise the temperature of the lead one degree Fah. In like manner, if I sent up this liquid metal, which is called mercury, and had it poured out from the ceiling, and let it come down upon this plate, the mercury in falling from the top of the house to the bottom would have its temperature raised one degree. But if I took water it would be totally different. In this case I should have to go, not to a hight of 30 feet, but to a hight of 770 feet and a little more, in order that the water should have its temperature raised one degree. You will understand this difference between water and mercury and between water and lead, by-and-by. I now wish you to understand that we can tell the exact amount of heat which a shot falling from a certain hight can generate or produce; and we should find an increase of heat produced in all such cases if we had instruments of sufficient delicacy. No doubt many of you will see when you grow up that fine waterfall in Switzerland where the river Aar jumps or tumbles down a perpendicular precipice. I suppose it jumps from a vertical hight of 400 feet. Well, if you could place a thermometer at the top of that fall, and another at the bottom, the water at the bottom, if the thermometer were delicate enough, would be found warmer than the water at the top; and knowing the hight from which the cataract plunges, we can tell the exact amount of heat generated by its fall downward, through this power of percussion in developing heat.

When I was a boy instead of using percussion caps, which are now so common for firing guns, they used to employ an instrument of this kind in guns—[exhibiting an old-fashioned gun lock]. Here is a piece of steel, and this other substance is a piece of ordinary flint which you see moves forward in this way. Now, I can cock that gun lock, and then by pressing on the trigger I release the hold, and the flint falls against the steel, and you notice the sparks produced. This is a very old lock, and a very bad one; but still you see there are sparks produced when I liberate the flint, and it strikes against this steel. If we put a little powder in the pan beneath the flint we imitate what used to be the method of firing guns in former days. [The lock was then primed.] Now, you see when I let the flint strike the steel the gunpowder is exploded by the sparks produced. In the same way tobacco smokers and others used to get a light by igniting tinder by means of the sparks produced from a flint when struck on a piece of steel.

Now, what is the meaning of this experiment? What is the theory of that gun lock? It is this. You have seen that when I struck the lead I raised its temperature. A very great man who used to lecture in this room many years ago—Sir Humphry Davy—caused a lock of this kind to go off where there was no air, and when he examined the lock afterward he found that the flint had struck away little bits of the steel from the part of the lock against which it struck; and when he examined those little bits of steel he found that they had been fused; so that really the percussion of this flint against the steel surface is so strong that it raises those particles of steel which it breaks off almost to a white heat. When steel or iron is thus raised to a high temperature it is affected by a certain substance which is round about in the air. You must remember the name of that substance, it is so very important. It is called oxygen; and when iron or steel is raised to a sufficient temperature, this oxygen instantly attacks it—plunges against it. As before, I must ask you to exercise your imagination with regard to this oxygen. You must figure in your minds this oxygen as very small particles diffused throughout the air. Then, I say, when the iron or steel is raised to a high temperature the oxygen diffused through the air plunges against it, and hits it so hard that there is a kind of percussion. The oxygen hits the iron or the steel so hard as to produce this thing that we call heat, and produce it in such a degree as actually to render the body white hot. Now, I want to show you that this is the case. I have here the means of producing a flame of considerable size; and down stairs we have a pair of bellows. A man has just quitted the room to work those bellows. A current of air will pass through this tube, and we shall obtain here a flame of considerable power. Now, what I want you to understand is this—that if by means of this flame I heat particles of iron or steel, you will find that those particles of iron or steel will shoot out like stars because of the plunging upon them of the oxygen of the air. Here I have a vessel containing these iron filings, and as I throw them on the flame you see the sparks produced are very brilliant indeed. The iron is burned in this way. I have thrown in sufficient of it to illustrate what I have been saying. First of all these particles of iron were heated exactly as in the case of the gun lock; and when they were heated the oxygen of the atmosphere plunged against them, and plunged against them so violently as to produce these star-like forms which you have seen. Some call this force attraction or chemical affinity; but what I want you to see is this—that these particles of iron when heated to this temperature are showered down upon by the oxygen of the air. This wonderful substance of the air, called oxygen, forms but a small portion of the atmosphere—about one fifth of it by weight. Hence, if we had the whole atmosphere composed of oxygen those effects of combustion would be very much greater indeed than they are at present. I have here some pure oxygen obtained by proper methods, and I will just ask you to observe how much more powerfully this atmosphere of pure oxygen acts upon a body than does the oxygen in the ordinary air, where it is diluted, as I have said, to a considerable extent. I have here a piece of wood which I set fire to. I blow the flame out then, leaving the end red. You see the air has no power to make it ignite again. If I bring it into the oxygen see what occurs. [The incandescent end of the stick was introduced into a jar of oxygen gas, and immediately burst into a brilliant flame]. The oxygen when it is not diluted has this wonderful effect. And so I might take paper or other combustible bodies instead of the wood. In fact I might use iron. I will produce here a flame from a mixture of oxygen and another gas called hydrogen, and I will cause the oxygen to burn, not a piece of paper or wood, but actually a piece of steel. I hold a piece of steel here in my hand. It is the spring of a watch. A man has now gone down to start the apparatus. I shall very soon have a jet of gas passing through here. I will ignite that jet of gas, and then you will see the flame of the hydrogen—not a brilliant flame by any means. [A jet of hydrogen was then ignited]. I will presently mix with the hydrogen flame which you see a quantity of this oxygen, but I want first to raise this steel to a very high temperature, and then to allow the oxygen gas to act upon it. I will now throw into this jet of hydrogen a quantity of this wonderful oxygen. You will see that the flame becomes very much smaller; and now it is enormously hot. Observe what it can do with that piece of steel. Observe how it can burn it away. This substance called oxygen is playing upon that spring. If I take away the hydrogen you see no flame whatever, but we have only the pure cold oxygen; but when once the temperature of the steel has been raised sufficiently, the force with which the oxygen particles, or atoms as I called them, plunge down upon the steel is sufficient to produce this wonderful effect. [The watch spring continued to burn in the jet of oxygen].

Well now, we have the generation of heat exemplified in this way. I showed you first of all that it could be generated by friction to such an extent that you were able to melt metal with it. I then showed you that it was generated by ordinary mechanical percussion, as in the striking of two pieces of lead by the hammer. And now I ask your power of imagination to help me here in the case of the oxygen uniting with the iron or the steel, which is, to all intents and purposes, a case of percussion. It is, however, a case of the percussion of atoms, instead of the percussion of a hammer descending upon a weight. Now, I think that if you have followed me I have not uttered a word that you cannot perfectly understand. You can picture before your mind these little oxygen atoms showering down with this tremendous force upon the surface of the iron; and the object I have in lecturing to you, boys and girls, is that you may see with the eyes of your mind those things which are too small to be seen with the eyes of your body, and that is the power I referred to in the first instance—the power of imagination.

I have here a variety of jars of this oxygen gas. I do not want to spend too much time in operating with them, but one experiment I must make because it is of such importance and such historic interest in science. The great Sir Isaac Newton, regarding whom a great deal of nonsense and a great deal of wrong has been uttered lately in the newspapers and elsewhere, operated with a diamond in the course of his experiments on optics; and he concluded from his experiments on the diamond that that beautiful gem, the hardest of all substances, was an unctuous, peculiar substance like wax or grease. Long before the experiment was ever made, this Newton by that very power which exists in every boy and girl here present, and which I called upon in the beginning of the lecture, saw that this beautiful gem was a combustible substance; and now I want to show you that Newton was true in his prediction. I have here a small diamond—(for diamonds are very precious, as you know, and it would be a wasteful expenditure, of course, to use a large one); and I will first of all heat it by means of this very hot flame that we possess here. I have there some oxygen gas, and after heating the diamond I will plunge it into the oxygen gas, and I think you will find it will there glow like a little star. Perhaps the hydrogen cannot heat it strongly enough, but we will try it. [The heated diamond was lowered into a jar of oxygen]. Yes, there is the diamond burning before you. And now, how are you to figure that diamond? How are you to imagine the state of things going on there? At the present time it is surrounded by oxygen; and the oxygen atoms, as I have called them, are showering down upon the diamond, and showering down upon it with such percussive force as to render it that bright and brilliant star. Now, I think every boy and girl here present can picture before his and her mind what is going on. Imagine these atoms of oxygen showering down upon the diamond, and the force with which they do so raises the diamond to that temperature.

In all these cases heat is actually generated. There is called into existence heat which did not exist before. It is, as I have said, a kind of motion which can be generated in the way which I have indicated.

Having now obtained a general notion as to the methods in which heat is generated, we may pass on for a moment or two to investigate what it can do—how bodies are affected by it

I have arranged an experiment here, in the front of the table, which will enable you to see what heat can do; and here again I would call upon that wonderful power of imagination. Imagine the particles of a body getting gradually warmer, vibrating with greater and greater intensity. What is the natural consequence? That these particles should force themselves assunder, that the body should become bigger by being heated, that the volume of the body should be augmented by the augmentation of its temperature. Here I have a platinum wire stretched from this stand to this. You observe that at the end I have attached a straw with a piece of paper fastened on it. Here you observe a little wheel, and from that wheel you observe a weight descending. Round the axis of the wheel a platinum wire is coiled. Now the platinum wire is pulling in one direction, and the weight is pulling in the other direction, but if you relax the platinum wire the weight will instantly predominate and the index will rise up. Observe that index rises if I relax the wire by simply pressing this rod to which one end of it is fixed; and when I take my hand away the wire remains no longer relaxed, and the index falls back again. (A great portion of what we call "experimental science" consists of devices of this kind. This was devised by my assistant, Mr. Cottrell). But how shall I heat that wire? By a power which is far away from here, which I hope to be able to talk to you about at some future time. Coming up from the yard beneath there is a power which heats the wire; it is called an electric current. When the current comes the platinum wire will be heated and elongated, and the elongation of the wire will manifest itself on the index. You see this piece of paper smoking with the heat of the wire. If I stop the current, the source of heat is detached, and the wire cools. When the wire cools it contracts, and when it contracts the index falls in this peculiar way.

I have another experiment here to show how heat operates in causing bodies to expand. I have here two bars—one of

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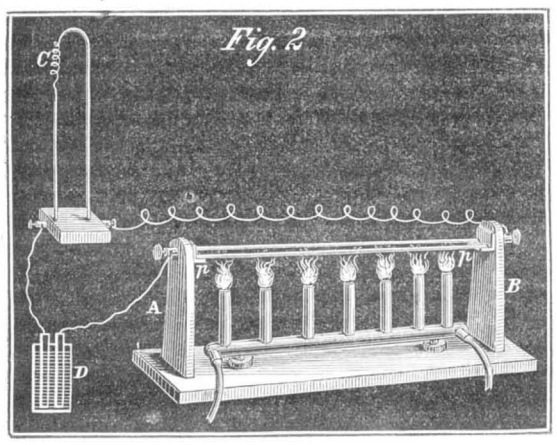
iron and the other of brass; and at the present time you see here in front of the table a little piece of apparatus the meaning of which you will understand immediately. I will show you that this wire which you see here in front is a little coil of platinum wire But before I show you this wire I should just like to show you what a power we possess for heating the platinum wire, when we augment our current. This current comes from a battery down stairs, which I trust to have the pleasure of explaining to you, not this year, but perhaps in some future year. Now the assistant will give me a powerful current, and I think you will see that this wire will be raised to redness throughout its entire length. [The electric current was then passed through the wire.] The platinum wire is now red hot, and the index goes up in this prompt way. You will see the glow of the red-hot wire now the light is lowered. Now, if I shorten the length of wire less and less resistance is thrown in the way of the current, and a greater amount of electricity passes through, and you have the wire raised to this much greater temperature. There is one thing to be observed here. You must not allow yourselves to suppose that this apparent thickening of the wire on being heated is due to a real thickening. The red-hot wire looks as thick as a quill. This appearance, which I have no doubt is visible to you, is not due to a real thickening. It is an effect produced by a bright light on the eye. A bright body is always seen larger than it ought to be, and this particular wire now before you is seen thicker by those in more distant parts of the theater than it is by those near at hand. This proves that it is a deception of the eye—a kind of illusion called "irradiation." It is not a real thickening. [The platinum wire was still farther shortened and then parted assunder]. There, the wire is now fused by this electric current.

Now, I will call back your attention to this spiral, C, which you see here. Here on one of these supports, A B, is a piece

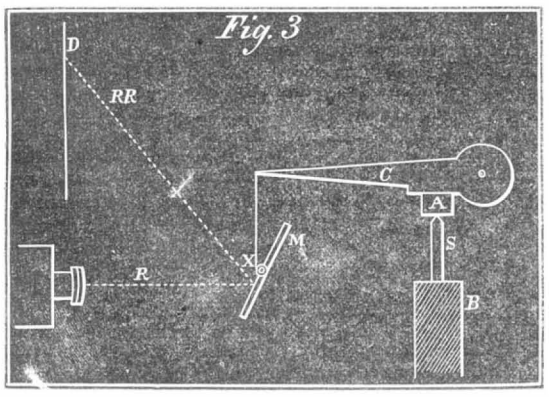
Fig. 2



of brass, p, and here is another, p'; and stretching across from support to support are two bars, one of brass and one of iron. At present they are not long enough to span the distance from one support to the other; but I will heat them, and then they will expand, and you will find that when they expand sufficiently to bridge this chasm from one support to another an electric current will pass, and then that spiral, C, will be like a voice telling us that the bars have expanded from one support to the other. We will now light the jets of gas underneath these bars, which at present are too short to span the distance between the supports. [After an interval]—Observe now that what I predicted a moment ago has occurred. The spiral is now ignited. If I remove this brass bar the spiral sinks. What I want to show you by this exeriment is that the brass expands more than the iron. It was the expansion of the brass which bridged the chasm across.

I have told you that a great portion of experimental science is taken up by devices of this kind to render these small expansions evident. I think there is before you on the floor in front of the table a piece of apparatus more delicate than any that has ever yet been made. It is an apparatus intended to show, among other things, the expansion of volume by heat. You will understand this apparatus immediately by reference to this small sketch that I have drawn upon the blackboard. I have taken simply the essential parts of the apparatus, and you will understand them, I am sure, perfectly well.

Fig. 3



The bottom part, B, of the sketch represents the upper end of that upright bar of metal which you see between those two brass pillars in the apparatus in the middle of the room. On the top of this bar rests a little brass stem, S; and the top of that stem is pointed and presses upon a very hard flat stone—a plate of agate, A. Now, conceive the top of this bar to be lifted, and to push this stem up against the plate of agate. What will occur? You see the arm, C, above the piece of agate. That arm moves upon a pivot which you see marked by a dot; a very little pushing of this arm causes it to move through a greater space than the body which pushes it. Now, attached to this arm is a piece of the hair spring of a watch, and that is carried round an axis, X, attached to which axis is a piece of looking glass—that is, a mirror, M. Upon that mirror a beam of light, R, is cast. The figure at the left of the sketch I suppose to be the front part of a lamp from which the light will issue. The beam of light will fall upon that mirror, and will be reflected upward, R R, and will mark itself as a spot of light upon the screen, D. Now, if you conceive the end of the bar to be lifted, and to push the arm upward, it will cause the axis of the mirror to turn round, and cause the mirror to take another position; and when the mirror takes another position, this beam of reflected light will travel with the mirror, and will travel with twice the velocity of the mirror. Thus, in this experiment, instead of having a straw for an index, I use a beam of light. You will understand the apparatus when I make the experiment. I think, as I have said, it is the most delicate instrument of the kind that has ever yet been made. Now I will try and get the apparatus in proper order for showing the experiment. I throw a beam of light upon the mirror, and there you see it reflected and quivering on the wall. I will bring it down so as to get it on the screen. You see it is exceedingly sensitive. That constitutes our index. And now I will ask you to observe what I am going to do. I will not touch that heavy bar of lead; I will not heat it with a flame; I will simply breathe against it; and I believe that this apparatus is so exceedingly delicate that the mere breathing against this mass of lead (and it is very large) will cause the lead to expand upward, and will bring down that spot of light from the top of the screen to the bottom. [The lecturer then breathed on the bar of lead, and the image of the beam of light gradually traveled down the screen]. The mere warmth of the breath is sufficient to produce this effect. Now I will pour upon the bar a little liquid that will chill it—make it cold; and I think you will find that as the bar cools it will contract, and that the beam of light will go back to the top of the screen. [The spot of light was successfully brought back to the upper part of the screen in the manner described.]

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Mathematical Formulæ.

MESSRS. EDITORS:—I send you this communication under the impression that its publication will be an acceptable service to engineers and others, who may have occasion to make the calculations referred to. The formulæ are deduced from well-known principles of geometry by the application of algebra, and are, I believe, new and original.

When I speak of the center of the engine, the reader will understand me to mean a point in a vertical line passing through the main center of the working beam. Now, it is certain that the center of the cylinder should not be placed at a distance from the center of the engine, equal to the length of half the beam; or, in other words, under the "end center" when the beam is in a horizontal position; but should be placed under the middle point of a line representing the versed sine of half the arc, described by the "end center."

The formulæ given below will enable any one conversant with figures at all, to calculate not only the true distance from the center of the cylinder without reference to the "vibration" or versed sine, but also to calculate when the distance, as above, and stroke are given, what length of beam is required.

Let b=half the beam. d=distance from center of engine to center of cylinder. s=half the stroke.

Formula No. 1.— $$d=\frac{b}{2}+\sqrt{\frac{b^2-s^2}{4}}$$

Formula No. 2. $$b=\frac{s^2}{4d}+d.$$

Suppose I wish to set up an engine the beam of which is 20·8 feet, and the stroke 8 feet, what distance from the center of the engine shall the center of the cylinder be placed to work correctly? By formula No. 1. b=10·4 and $b\div2$=5·2, b^2=10·4²=108·16; and 108·16—s^2 or 16=92·16. 92·16÷4=23·04, the square root of which is 4·8; hence, 5·2 plus 4·8=10 feet, equal the distance required.

Suppose an engineer takes charge of a steamer, and by measurement finds the distance from center of engine to center of cylinder is 9 feet, and the stroke 9 feet, and he wishes to find the length of a beam, which shall work correctly.

By formula 2. s=4·5 and s^2=20·25. 20·25÷4d, or 36=0·5625; and 0·5625 plus d; or 9=9·5625, the true length of half the beam.

The formulæ above, if translated into words, would be as follows: No. 1. The distance is equal to half of one half the beam, added to the square root of the quotient of one fourth the difference between the square of half the beam and the square of half the stroke.

No. 2. Half the beam is equal to the quotient of the square of half the stroke, divided by four times the given distance, added to the distance. N. B. WEBSTER, C. E.

Kenansville, N. C.

Slack Water Navigation.

MESSRS. EDITORS:—In your journal, No. 3, of the current volume, is an article on Slack Water Navigation, which very judiciously sets forth the many advantages to accrue from such a system properly managed. More than twenty-five years ago the State of Kentucky expended nearly $2,000,000 in a system of slack water improvements on the Kentucky and Green rivers.

The experiment, taking into account the increased value of lands, and corresponding increase of revenue from taxation, has proved the investment eminently wise, although proper frugality has not been observed in expenditures.

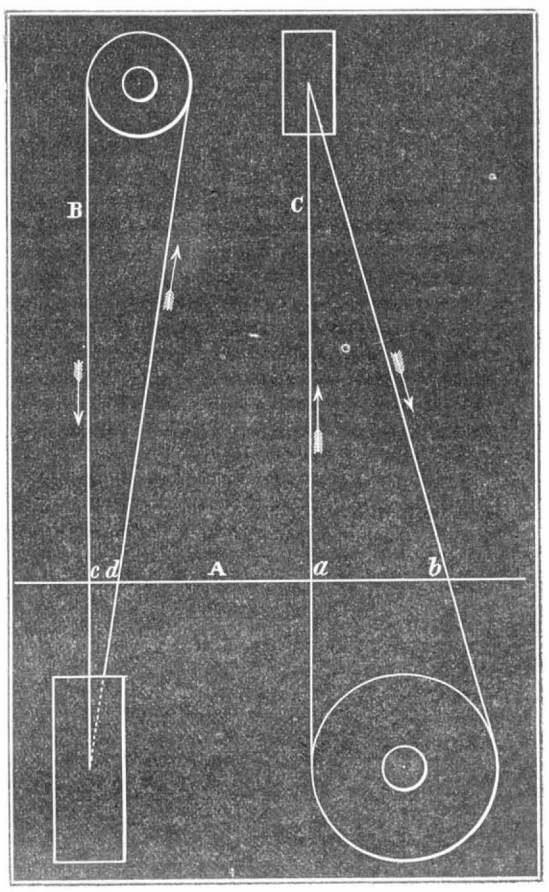
A private company is now preparing to lock and dam the Kentucky river for two hundred and fifty miles above the present limit of navigation. This will give constant, cheap, and safe transportation to an inexhaustible supply of coal, iron, and lumber. The experience of Kentucky fully indorses slack water improvements as useful and economical.

JOHN MASON BROWN.

Frankfort, Ky., January, 1868.

Belt Holes--Quarter Turned Belts.

MESSRS. EDITORS:—One of your correspondents asks how to lay out holes through a floor for a quarter-twist belt. The only proper method is by diagrams. Sweep a clean place on a smooth floor and set out with chalk line and "tram" two views of the pulleys and the floor, getting the distances as



accurately as possible, or lay them down on paper to a suitable scale. Notice that a belt to work at quarter twist must run *on* to both pulleys in a line parallel with the plane of rotation, as B, in the diagram, running on the lower pulley, or C, running in an opposite direction on the upper one. Therefore, drop the perpendiculars, B and C, as shown, and draw the diagonals, giving the distances, $a\ b$ and $c\ d$, on the floor line, A. Now drop a plumb line from each side of the upper pulley at the center of the face to the floor, and from one point so found, c, in the diagram, lay off the distance, $a\ b$, in a line parallel with the upper shaft, and from the other point, a, in the diagram, the distance, $c\ d$, parallel with the lower shaft; the points so found will be the centers of the belt holes. The twist to be given to the holes, if such a refinement is necessary, may be made a matter of judgment.

Rochester, N. Y. F. H. C.

[We have engraved and published the accompanying diagram for the purpose of illustrating a subject which seems to be somewhat puzzling to mechanics. On page 169 of Vol. XVII. we published some directions for laying out belt holes through floors, which we thought to be sufficiently explicit and plain to be easily understood without the aid of diagrams. But from a number of communications on this subject, since received, it is evident that the subject is not yet fully understood, and we publish our correspondent's diagram and description with a hope that they will make the matter plain. It is of very great importance to all mechanics, especially to millwrights, and we trust that this, with the article to which we have referred, will furnish the desired information.—EDS.

Patentability of Medical and Surgical Improvements.

MESSRS. EDITORS:—Knowing how great an interest you take in all matters pertaining to the welfare of the inventing class, and how ably you have heretofore defended their cause, I take the liberty to bring to your notice an abuse, which is now being carried on rather extensively, and which, if allowed to continue, will seriously endanger the prospects of many of our ablest inventors. I am sorry to say that the offenders of the patent law, to which I have reference, belong to a very respectable class of society, and this makes their offence still more aggravating.

Among the medical profession, it has always been a point of honor, that all discoveries made by doctors for facilitating the cure of diseases, should be surrendered to the whole profession. It is evident that to this arrangement the rapid development and present comparative state of perfection of medical science is mainly due, as we would, if each doctor had kept his discoveries to himself, be still on the same leve with the physicians of ancient times. But this principle o mutual information and instruction seems to be misunderstood by a great number of the physicians of this country, as they appear to claim, under cover of the above principle, all the *mechanical* inventions made by their colleagues. I have

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heard of a number of cases, in which doctors who have made valuable inventions in the construction of surgical apparatus, or of machinery for preparing certain kinds of herbs, or other medical substances, and who intended to secure the benefits of their inventions by applying for patents on the same, were threatened with immediate ejection from the medical society if they insisted in patenting their inventions. The non-inventors argued that the mechanical inventions came under the same head with professional suggestions, and had to be surrendered accordingly.

It may not be out of the way to call your attention to another danger which threatens the community, although at present only that of the State of New York. The convention now assembled to revise the State constitution, has a bill under consideration which has the object of taking from the physicians the right to prepare and forward medicines, such a right being solely vested in the apothecaries. This is a blow aimed solely against the homœopaths, who have to prepare their own medicines, and who will by this act be banished from the State. For allopaths, this bill may be very beneficial, but if the convention should be short-sighted enough to adopt it, they will destroy a branch of the medical profession which is already very popular, and increasing in the number of its adherents very rapidly. V. B.

New York city.

The Meteorograph an American Invention.

MESSRS. EDITORS:—In your issue of Jauuary 11th, page 19, I have just read an extract from the *Nation*, describing partially an instrument called the Meteorograph, which is said to have been invented by Father Secchi, of Rome, and to have received a grand prize at the Paris Exposition. Doubtless, it was a very ingenious apparatus, and it has a very expressive name, but your correspondent had the honor to exhibit drawings, and explain the construction of an invention remarkably similar (except in its connection with a galvanic battery), at the Washington meeting of the American Association for the Advancement of Science, in May, 1854. Can the word, *Meteorograph*, be found in any publication prior to newspaper reports of that paper?

The "Proceedings of the Eighth Meeting of the American Association" contain a partial description of this automatic meteorological register, page 224. It is there described as recording for every minute of time, night or day, for periods of one week, on each paper, the direction and force of the wind; the hygrometric, barometric, and thermometric state of the atmosphere; also, the time of the commencement, duration, and other phenomena of rain storms, as well as the quantity of water precipitated. A brief reference is also made to this apparatus in the Annual of Scientific Discovery for 1855.

I inclose a description of the invention, from the Portsmouth (Va.) *Globe*, of April 24th, 1854, written by the editor who examined the Meteorograph in operation.

Prior to the writer's invention (and he made the name as well as the machine) the most efficient anemometer was Osler's, which was expensive and complicated, while this was described as "marvellously simple." A few cylinders, moved by a common eight-day clock, were covered with paper, on which the meteorogram was recorded as described, in the proceedings of the American Association for the Advancement of Science above referred to.

I send this communication for your consideration of the propriety of placing on record, in the widely circulated and carefully preserved columns of the SCIENTIFIC AMERICAN, the date and origin of the Meteorograph.

Kenansville, Duplin county, N. C. N. B. WEBSTER.

Gold in Orange County, N. Y.

MESSRS. EDITORS:—Very soon I think we shall be overflowing with petroleum aud rich in gold. A gold mine has recently been discovered in Cornwall, about five miles below Newburgh, in this county, by John L. Davis, of that place. A stock company, with a capital of $100,000, has been formed, and preparations are being made for the working of said mine. Specimens of the quartz have beeu exhibited in this place. Whether it will amount to anything or not remains to be seen. The place where the gold was found is called "Bulter Hill," the place where the glass ore "Basalt" was extracted from. J. C. G.

Newburgh, N. Y.

Elevated Railroads.

In reply to several correspondents requesting us to give descriptions of elevated railways, we would state that nearly all of the plans that have lately been presented to the public are simply old devices revived. We have engraved and described many of them, as a reference to our back volumes will show. Here is one which we published in the SCIENTIFIC AMERICAN November, 1847—a little more than twenty years ago:—

"A number of inquiries have been made relative to Mr. Randall's invention, and as the model was exhibited lately we take this opportunity of giving some information regarding it. We have been informed that the model constructed by order of the Common Council of this city, is entirely of metal, and cost $4,000 and two years labor. It weighs about three tuns, is seventy-six feet long and nine feet wide It is to be erected only twelve feet above the line of curbstone. The passenger cars, which are to be propelled by stationary engines and an endless rope, do not stop to take in or let down passengers. This is accomplished by means of a tender, which passes along a side track, and by means of a brake, pressing on a brake plate fixed to each car, the speed of the tender is got up to be equal to that of the passenger cars, before they are fastened to each other for the exchange of passengers. To prevent the cars from leaving the railway, each car is confined by sixteen pulleys with vertical shafts, two to each of the wheels. It is also provided that if either the axles, the shafts, the car wheels, or the transverse beam which passes quite across the street, should break no danger would arise from the breakage. Passengers need not walk up the stairway but ascend by a screw shaft, containing a sofa, on which they ride from the pavement to the promenade. The model was constructed by Mr. Randall, the inventor, by whom it is patented."

The London Underground Railway.

From an English engineer now traveling in this country, and who was before connected with the construction of this work, we learn several items of interest. Thus, the engines employed are not, as is generally supposed, specially arranged for the suppression of smoke, etc.—in other words, of what is here known as the dummy pattern,—but are precisely of the usual form, with the exception of two points. In the first place, they are so arranged that the exhaust may be, at will, turned into the tank, in place of the chimney; and secondly, the furnace may be shut up air-tight at a moment's notice.

The plan of working them is as follows:—The road, we should premise, is not a continuous tunnel, but a series of alternate tunnels and open cuttings. In the open cutting the engines are run as on any other road; but as soon as a tunnel is reached, the exhaust is turned into the tank, the fire-box shut tight, and the engine run through by the accumulated heat in the furnace and boiler. The cost of this road, it may also be interesting to know, was about $4,000,000 per mile.—*Journal of Franklin Institute.*

Newspaper Change.

Mr. Moses S. Beach has sold the New York *Sun* establishment to the *Sun* Printing Association, an incorporated company, and Mr. Charles A. Dana, formerly assistent Secretary of War, has become the Editor and Manager. The *Sun* is one of the oldest and best papers in the city, and has a daily circulation of over 50,000 copies. It has passed into the hands of an able management, and will long continue we trust, brightly to shine for all. Mr. Beach continues as a large shareholder in the concern, but retires from active business.

The Weidenman Rubber Shoe Stay.

In No. 4, present volume, we published an engraving and description of a contrivance under the above title, which might possibly mislead the reader in one statement. Instead of the stay being introduced into the shoe in the process of manufacture, it is entirely independent of the shoe, and may be fastened into any rubber shoe by an eyelet and hook. Its advantages can be understood by a reference to the engraving.

Editorial Summary.

POISONOUS VISITING CARDS.—There is a style of visiting cards introduced to the public some months since, under the name of crystallized, or "Mother of Pearl" cards, and from their unique and attractive appearance they have been very much admired. But a chemical investigation of the crystallized surface shows that its composition is quite as dangerous a poison as was used in the once popular enamelled cards. The fact is first brought to our notice from a foreign source. A writer from Munich to the *Journal of Pharmacy* asserting that these novelties had been imported from our country, and for a time enjoyed a great run of popularity, the demand far greater than the supply. But, unfortunately for the manufacturers, one of them fell into the hands of the Medical Director of the Sanitary Department of Munich, and an examination showed that a card two and a half inches wide and four inches long, weighing 33½ grains, yielded as its crystallized coating 6.6015 grains of acetate of lead, a poison the more dangerous, especially to children, from its pleasant, sweet taste.

DETERMINING THE COLORS OF THE STARS.—To the astronomer this is a subject of much interest, and different observers vary greatly in their opinions in this respect as to particular stars. For the sake of a more definite and reliable means of determination, a simple contrivance has been recently invented, consisting of a series of vials filled with solutions of known tints, and attached to a revolving drum. A platinum wire is rendered incandescent by means of a galvanic battery, and as the vials are brought befere the light their colors can be distinctly seen at night, and by successive comparisons with that of the star the exact shade is found.

A DEVOTEE TO SCIENCE.—M. Dolfus Assuet has determined to erect a chalet on the summit of Mount Blanc, and establish therein a meteorological observatory, which will therefore be placed at an elevation of about 16,000 feet above sea level. He has hired two guides to spend the summer months in this desolate station, for the purpose of making observations. During the past twelve months this same *savant* has supported three guides in a chalet on the Col de St. Theodule, at an altitude of 10,500 feet, and the value of their meteorological observations has induced him to make a fresh experiment.

A STOCK COMPANY has been formed at Cornwall, on the Hudson, for the purpose of bridging the Hudson River from "Storm King" to "Butter Hill," the bridge to be of wire cable and strong enough to allow the passage of trains, perhaps for the Hudson River Railroad but more likely the Dutchess and Columbia cars, will take this route. The plan appears to be feasible and the people generally in favor of it.

A CORRESPONDENT writing from Mossy Creek, Jefferson County, Tenn., states that a New York Company is now erecting zinc paint works of an extensive character at that place. The ore is said to be all that could be desired. Tin is reported as having been found in the Smoky Mountains.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

In his annual message, the Governor of New Jersey very justly places great importance upon the mineral wealth of that State, particularly its mines of iron and zinc. Last year more than 250,000 tuns of the richest iron were transported to market, an amount valued at the mines at one million dollars. The zinc mines yielded, during the same period, 24,000 tuns of ore, all of which was manufactured into spelter, or zinc oxides, within the State. This product is more than half the yield of the United States, and exceeds the supply from all the British mines.

The gathering of sponge among the Bahama Islands, for use in upholstery or, as noticed in another part of this paper, for textile material, has become a business of great magnitude. The Nassau *Herald* speaks of no less than fifty-seven vessels engaged in the trade, and recent sales were made of 12,500 strands of sheep-wool sponge at $1.00 per strand.

The Paris correspondent of one of our daily papers writes that the street cars in that city run on flat rails, with wheels without flanges, the whole being kept in place by a fifth wheel, but a half inch thick, running in a grooved central rail, laid for the purpose. This additional wheel being attached to the carriage by a lever, can be raised at will by the driver, and the car runs off the track. This is done to turn out either for a car running in the opposite direction on the same track (which saves a double track on a road but little used), or for another vehicle, or to run more conveniently on a down grade.

Quicksilver has recently been found in Macon county, Tenn., at a point thirty miles from the line of railroad from Cincinnati to South Carolina. The yield has been 7½ per cent, or 150 pounds of quicksilver to the tun. All that is required for separating the metal from the gangue, is simply retorting it.

The manufacture of leather is one of the most important national industries of Italy. The number of leather manufactories in the kingdom amount to 1,175, employing about 12.500 workmen, and producing about 282,346 cwt. per annum, to the value of $1,250,000. The art of making parchment is carried on to a large extent at Arpino and Sulmona, from whence are annually exported about 6,600 lbs.

It appears that the Gatling revolving gun, illustrated and described in our columns, is to be very generally introduced into European armies. According to the Ausburg *Gazette*, the agents in Carlsruhe have received orders for one thousand of these guns. Of this number, 400 are designed for France, and 200 for Russia, the remainder being equally distributed between Austria, Italy, Belgium, and Holland.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

RAILROD SWITCH.—J. B. Spurgin and T. A. Kirk, Kansas City, Mo. —This invention has for its object to furnish an improved railroad switch so constructed and arranged that no switchman will be required; that two trains can pass each other in motion upon the switch with safety. that trains may pass over the switch at full speed without danger of accident from false switching; and that the engineer by simply moving his train forward and backward can transfer it from one main track to the other or to the switch track as he may desire.

GLOBE VALVE.—H. H. Hendrick, Dayton, Ohio.—This invention consists in forming the valve of chilled or case-hardened iron and so attaching it to the valve stem that the valve is self adjusting.

ADJUSTABLE SPIRIT LEVEL.—William J. Tate, New Haven, Conn.—This invention relates to a new spirit level which is so arranged that it can be reset, with great ease when not quite correct.

ROLLING MACHING.—George Hastings, Jr., Wheeling, West Va.—This invention relates to a method of constructing machines for rolling iron and steel into sheets or plates and for scouring the same for making nails and for other purposes.

PUDDLING FURNACE.—William Stevenson, Allegheny City, Pa.—This invention consists in an arrangement whereby the pig iron used in puddling furnaces may be heated by the heat generated in the furnace previous to being put in the furnace, thereby utilizing heat that would otherwise be lost and greatly facilitating and expediting the process of making iron.

TWEER IRON.—Lyman M. Bailey, Landgrove, Vt.—This invention relates to an improvement in what is known as the concave tweer iron for blacksmith's fires, and it consists in the arrangement of a valve whereby the fire may be regulated to suit the work in hand as may be desired.

DRAWER TRUSS.—Zalmon Taylor, New York city.—This invention relates to a truss for obtaining pressure on ruptures, whereby the inconveniences and objectionable features of the ordinary spring truss are overcome.

OX YOKE.—Joseph Langenbach, Dorchester, Iowa. This invention relates to a new manner of arranging ox yokes so that they can be readily fitted and secured on the necks of the animals and that they can be adjusted to fit large or smaller necks.

HANDLES FOR METAL TEA AND COFFEE POTS.—William Bellamy, Newark, N. J.—This invention consists in having the handle hollow or tubular and filling it with plaster of Paris which will keep the handle in a cool state

REAPER OR GRAIN HARVESTER.—J. B. McCormick, St. Louis. Mo.—This invention relates to a raking and a gavel-delivering attachment for reapers, whereby the cut grain is raked from the platform of the machine upon a tilting table which is operated in such a manner as to deliver the cut grain raked upon it to the binders. The invention consists in a new and improved means employed for operating the rake over an inclined curved or segment platform and in the use of the tilting gavel-receiving table also operated in a peculiar manner.

CORK SCREW.—George Twiggs, Birmingham, Eng.—This invention consists of the handle of the same, being provided in the center with a nut, fitting the screw thread on the shank of the cork screw, so that by turning the handle in one direction the nut will bear upon a shoulder on the bell or barrel of the same, and thus draw the cork screw and any cork attached thereto up into said barrel or bell.

CORN CULTIVATOR.—Charles Rich and Oscar L. Neisler, Poughkeepsie, N. Y.—This invention relates to a new agricultural machine, which can be used for cultivating corn, or for broadcast harrowing or tilling, and which is adapted to straddle a row of corn of ahigbt of more than five feet.

CULINARY VESSELS.—Wm. H. Bennett, New York city.—This invention consists in discontinuing the perforated bottom of the inner vessel of a cooking apparatus, so that it may not reach beyond the perforated inner wall of the vessel, to permit the space between the perforated inner and the outer wall of the vessel to be cleaned.

SASH FASTENING.—C. M. Amsden, Wooster, Ohio.—The object of this invention is to hold the sash more firmly in place, and at the same time to secure a free and easy movement for it.

COTTON PRESS.—Paul Williams, Winona, Miss.—This invention relates to an improvement in cotton presses, and consists in the combination of a lever having a long and short arm with a vertical screw, to actuate the same, whereby the follow block receives its motion from the shorter arm of the lever, and is forced down with great power. Other devices perfecting the whole render this press more simple than, and equally effective with, any cotton press heretofore known or used.

WASHING MACHINE.—Benj. F. Stover, Ladoga, Ind.—This invention refers to improvements in machines for washing clothes, and consists of an inclined plane and curved surface, joined, over which a smooth roller is actuated, together with other parts perfecting the whole.

CONSTRUCTING AND PROTECING SUBAQUEOUS TUBES.—T. F. Rowland, Greenpoint, N. Y.—This invention consists in constructing and protecting subaqueous iron tubes, and it consists in encompassing the same with blocks of cement or tile, arranged or applied in such a manner that the water cannot come in contact with the iron tube, nor the tile or cement blocks become detached from the tube.

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PAPER PULP.—Hippolyte Emile Ballière, Hoboken, N. Y.—This invention relates to the manufacture of paper pulp, half stock binder board, papier maché, etc., and fibers for textile fabrics or materials from bamboo, cane, and other vegetable and woody fibrous substances which have been previously disintegrated by the process embraced in the Letters Patent granted to H. S. Lyman of New York city, on the 3d day of August, A. D. 1858, and now commonly known as the "Lyman Steam Blowing Process," or by any other equivalent process or processes.

PLOW.—W. T. Howell, Alfred, N. Y.—This invention relates to an improvement in that class of plows which are commonly termed "shovel plows," and it consists in a novel and improved manner of attacking the blade or share to its standard, whereby a very firm attachment is obtained and one which will admit of the share being very readily applied to and detached from the standard.

PLOW.—D. W. Hughes, Quincy, Ill.—This invention is designed to reduce friction draft in plows and consists in dispensing with the ordinary land side substituting therefor a supplemental share which is placed at the rear of the front plow and has a reverse angular position to the latter, so that the lateral pressure exerted against one share in one direction, will compensate for that exerted against the other in an opposite direction, The invention further consists in placing the plows at the outer side of the wheels, so that both the latter will travel over unplowed ground.

AXLETREES.—Charles E. Buck, Racine, Wis.—This invention relates to an improvement in wooden axletrees for wagons, and it consists in the application of a rod to the axletree, whereby the axle is greatly increased in strength.

FLOUR SCOOP.—Rufus S. Mitchell, Elizabeth, Ind.—This invention relates to an improved flour scoop, and consists in combining a sifter and scoop in one device.

BOOT CRIMP.—J. Tipton and J. Carl, Malaga, Ohio.—This invention is an improved device for crimping leather for the manufacture of boots, shoes, etc., by which the operation can be performed more easily, quicker, and better than by the methods hitherto in use.

SELF-SUSTAINING HOOF EXPANDER.—John Tipton, Malaga, Ohio.—This invention is designed to expand the hoot of a horse in case of its contraction from corns, or other diseases of the foot, or from any other cause.

MACHINE FOR SAWING SHIP TIMBER.—John L. Knowlton, Philadelphia, Pa, —In this invention the saw is supported by a yoke which allows it to be inclined in any direction, vertical or horizontal, for the purpose of changing the direction or inclination of the cut. The yoke is attached to a carriage which feeds the saw to the log, the latter simply moving backward and forward in the same line for all the different cuts.

RAT TRAP.—John C. Guerrant and Benton J. Field, Leaksville, N. C.—This invention relates to a rat trap provided with a movable platform upon which the rat stands in order to get at the bait, the pulling of which draws a stop pin away from a lever, which when thus released is actuated by a spring and through suitable connections made to suddenly jerk the platform from under the rat, which in falling into the trap, strikes a rod, which causes the spring lever to be again actuated, so as to restore the platform to its original position.

MACHINE FOR CUTTING DYE WOODS.—Onsville E. Pray, Portsmouth, N. H. —This invention relates to an improved machine for cutting dye woods into pieces or chips direct from the log. The invention consists of a rotary drum provided with cutters at its periphery, and arranged in relation with an inclined trough containing a feed bar, which is operated by a rack and pinion.

DEVICE FOR FACILITATING THE NAILING OF LATH TO JOISTS OR WALLS.—Thomas Hill, New Centreville, Wis.—This invention relates to a device for facilitating the nailing of lath to joists or walls, and it consists in a novel construction and arrangement of parts, whereby a number of lath may be adjusted together and held in proper position, so that they may all be applied to the joists or wall at the same time, and nailed thereto.

MACHINE FOR MANUFACTURING SHEET LEAD AND LEAD PIPE.—Andrew Dow, Brooklyn, N. Y.—The object of this invention is to arrange a machine for making sheet lead in such a manner that the same can be easily converted into a machine for making lead pipe.

MACHINE FOR SAWING HOOPS.—Abraham Lutz, Orangeville, Ill.—This invention relates to an improved arrangement of springs and bearings in machines for sawing hoops from poles, whereby the pole is more easily and securely held in its proper position while being fed to the saw, and which improvement is applicable to ordinary sawing.

TRUSS, ABDOMINAL SUPPORTER, ETC.—Jules Lecocq, New York city.—This invention has for its object to furnish a simple, light, and effective truss, etc., which may be worn without annoyance or fatigue, and which will not chafe the body of the wearer.

STEEL TRAP.—C. P. Goss and Adrian Rais, Waterbury. Conn.—This invention relates to an improvement in the construction of steel traps for catching rats and other vermin, and consists in making a combined spring and bottom plate or support of the trap out of one piece of metal.

GOVERNOR.—Wm. L. Collamore, Warren, R. I.—This invention relates to a governor for steam engines and for other purposes where governors are usually employed. The invention consists in a novel application of a supplemental weight or weights to the ordinary ball governor, whereby the governor is rendered far more sensitive than at present and a material saving of steam and fuel effected.

ATTACHING OR SECURING SPRINGS.—Daniel Witt, Hubbardston, Mass.—This invention relates to a mode of securing or bolding springs, and is more especially designed for securing or holding in position upholstery springs and those which are applied to chairs, etc., etc. The object of the invention is to obtain a simple and economical means which will admit of the springs being readily attached to the fixtures designed for them, and which will firmly hold the springs in position.

FILLING SYPHON BOTTLES.—William Gee, New York city.—This invention relates to an apparatus for filling glass syphon bottles, those designed for holding liquids impregnated with carbonic acid gas, and which are provided with a faucet or valve to admit of the liquid being drawn from the bottles as required for use. The object of the invention is to obtain a device for the purpose specified, which will admit of the bottles being charged or filled with the greatest facility, without material waste of liquid, and which will admit of being adapted for filling or charging bottles of different shapes or patterns and capable of being adjusted to suit the hight of different operators, so that a man or boy may use the apparatus.

DASHER.—Morgan O. Davis, Warrensburg, N. Y.—This invention relates to a new method of constructing dashers for churns, by means of which the butter is separated from milk in a much shorter time, and the same is more easily taken apart to be cleaned.

FENCE.—Daniel Kaufman, Boiling Springs, Pa.—This invention has for its object to furnish an improved fence, simple in construction, light, strong, and durable, and one which can be easily and quickly put together.

MACHINE FOR FILLING SAUSAGES.—Martin Feuerstein, Williamsburgh, N. Y.—This invention relates to a machine for filling sausages, and consists in the use of a cylindrical vessel into which the material to be filled into the skins is placed, and in which a piston is arranged, by which the contents are gradually forced downward.

COMBINED HARROW, PLANTER, AND CULLIVATOR.—J. G. S. Garwood, Vermillion, Ill.—This invention has for its object to furnish a simple and convenient machine which shall be so constructed and arranged as to be easily adjusted for use as a harrow to prepare the ground, as a planter, to drop and cover the seed, and as a cultivator to cultivate the crop.

GAGE COCK.—W. G. Thomas, Centralia, Pa.—This invention relates to an improvement in gage cocks for steam boilers, and consists in forming the same in several removable parts, so that the certain parts which may require repair can be taken off and repaired while there is steam in the boiler.

DREDGING MACHINE.—Thomas Walsh, and Augustin Walsh, New York city.—This invention relates to a new mode of dumping the contents of buckets of dredging machines, by means of having the buckets made in the form of a quadrant, with hinged arms attached to them in such a manner that they can be opened and closed at the pleasure of the operator.

MEDICAL COMPOUND.—James T. Stewart, Peoria, Ill.—This invention has for its object to furnish an improved tonic, stomach bitter, and, as a secondary effect, blood purifier, which is applicable to all cases of debility, and especially those resulting from and following ague and other malarial fevers, and which may be taken freely and for a great length of time without producing headache or other unpleasant symptoms.

RAILROAD CLAMP.—John E. Watkins, Smithfield, Ky.—This invention has for its object to furnish an improved clamp for railroad rails, by means of which the end of the rails may be kept in line, both vertically and horizontally with each other, and which shall hold the ends of the rails firmly and securely, at the same time that it does not interfere with their contraction and expansion.

WASHING MACHINE.—Henry Helm, Pittsburg, Pa.—This invention relates to a method of constructing washing machines, whereby the same are more convenient, and clothes are more thoroughly and quickly washed.

CANDLE HOLDER.—S. J. Rockwood, Elsah, Ill.—The object of this invention is to construct a holder for a candle in such a manner that it will receive and hold candles of varying sizes, whether large or small in diameter, and without either cutting or wrapping up the candles.

HAND HOLE COVER FOR STEAM BOILERS.—Gilbert White, New York city. —This invention consists in a peculiar modification in the application of the packing or gasket of a hand hole cover for steam boilers, whereby a tighter or closer joint is obtained than hitherto, and the packing or gasket rendered less liable to become injured or deranged in applying the cover to the hole, and taking it therefrom.

ROTARY BLOWER.—P. H. and F. M. Roots, Connersville, Ind.—This invention relates to a new manner of constructing the shells of that class of rotary blowers and engines, in which two revolving pistons, whose peripheries are formed by arcs of different diameters, connected by suitable sides, are arranged. The invention consists in forming within the shell at suitable distances apart, projecting packing straps, against which the outer peripheries of the pistons work.

APPARATUS FOR FLOCK MACHINES.—Henry Turner, New York city.—This invention relates to a device for automatically feeding the fibrous material from which flock is to be made, from a box or other suitable receptacle to the grinding or tearing cylinder, and consists in arranging agitators in the aforesaid box or receptacle, by which the material is constantly stirred and fed to an endless apron, which is provided with cups, for carrying the said material to the hopper on the tearing cylinder. Plungers are provided on a crank shaft, which is arranged above the hopper, by which plungers the material is received from the apron, and delivered to the cylinder, and by which it is prevented from becoming clogged in the hopper.

VIOLIN.—Bambridge Bishop, New Russia, N. Y.—This invention relates to violins, bass viols, guitars, and other similar musical instruments, and consists in continuing the finger board over the sound board to the foot of the instrument, and in there fastening the end of the strings, whereby the finger-board is made to support the whole tension of the strings. And in combination with the above, the use of a supplementary bridge resting upon the finger-board in such a manner that the pressure of the strings upon the sound board bridge can be controlled without altering the pitch of the strings, or the hight of the sound board bridge, thereby giving the strings the pressure in the sound board bridge requisite to produce the most perfect tone, within the power and capability of the instrument, and the sound board is relieved of all contact from dead wood, and thus left freer for vibration, and consequently to give out a fuller, more even tone.

BUCKLE.—C. W. Martin, Mount Pleasant, Iowa.—The present invention relates to a buckle intended more particularly for use upon traces to harnesses of horses, the nature of the invention consisting in providing a means by which the chafing of the sides of the animal is prevented, and the possibility of the tongue to the buckle pulling and splitting out the trace, from the strain by the animal, is obviated.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address the correspondent by mail.

SPECIAL NOTE—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

P. C., of R. I.—Strong nitric acid will set fire to turpentine charcoal powder, or sawdust. There is danger of fire if it is stored where it is liable to leak out on straw or shavings.

J. H. T., of Pa., asks how to render leather hard without destroying its fiber. It can be done simply by saturating its substance with shellac dissolved in alcohol or glue applied quite warm, and not injure its fiber.

P. D., of Va., sends us a small package of shiny black grains and asks their nature. They are particles of the magnetic oxide of iron. Such sand often contains gold, but where it is abundant, even if not auriferous, it is valuable, yielding iron of excellent quality. We have no doubt large deposits exist in this country which have not yet been reported.

F. S. C., of Mass.—Bone and ivory may be softened by soaking in hydrochloric or acetic acid, The acid dissolves the mineral matter upon which the hardness of the material depends.

J. W., of Mass., wishes to know how to prevent his flour paste from molding. Add a little creosote, carbolic acid, or bisulphite of lime. Neither of them will impair its adhesive qualities.

P. J. P., of N. Y.—When the vapor of water is compressed it returns to the liquid form. A common rule for estimating the comparative volumes of steam and water is to reckon one cubic foot of steam equal to one cubic foot of water.

W. H. N., of N. J.—The French emperor has taken the initiative in the unification of coinage by minting gold coin stamped "5 dollars—25 francs."

J. M. S., of Vt.—Sulphuric, nitric, and many other acids can be detected by dipping a piece of litmus paper in the solution suspected of containing the acid. If it is present the blue of the litmus paper will turn to red. The paper can be obtained of any druggist.

A. C. D., of Pa.—White lead is not an acetate of lead; it is called carbonate of lead. The method usually employed in this country for its production is to expose very thin sheets of the lead, rolled loosely into cylinders, to the hot fumes or vapers of acids in closed receptacles. The acid vapors disintegrate the lead and the carbonate falls in the form of a paste or wet powder. It is then washed to separate the acid and ground with oil.

M. S., of Conn.—Glycerin and nitro-glycerin are two entirely different substances. One is an emollient, useful in the toilet and in medicine. Nitro-glycerin is a highly explosive substance and dangerous, Glycerin is a thick, sirupy liquid, having but little color, no smell when pure, oily or sticky to the touch, and sweet to the taste. It is entirely innocuous. Nitro-glycerin is the union of glycerin and nitric acid. Like many other compounds it does not show the characteristics of either of its elements.

D. A. K., of Md.—Whiting, or Spanish white, is a preparation of chalk, merely ground fine and washed. French chalk or tailors' crayons is a variety of talc or steatite—soapstone—colored by any coloring matter to give it body and shade.

A. J. K., of Wis.—Spanish gun barrels were formerly very highly valued, their superiority being attributed to the excellent iron which was made almost exclusively of stub nails and old horse or mule shoes.

W. P. T., of N. H.—If you desire to give your brass levers density and hardness not obtainable by the quality of the composition, it can be done by hammering them after leaving the foundery. This will harden the brass and give it greater resistance to wear. It must be hammered when cold.

J. B. P., of Mass.—"Suppose a hole be made through the earth from pole to pole, and a cannon ball be dropped in at one of the poles, what would be the course of the ball? One person maintains that the ball would go only to the center and there stop. Another that it would go beyond the center and then return; and that this movement or oscillation would be repeated, but gradually becoming feebler till the ball rested at the center. A third claims that if there were no obstruction or resistance, the ball would fall through to the opposite pole and would then return to the starting point; and that this oscillation from pole to pole would go on forever." The first philosopher is wrong. The second and third are about right. The question discussed is a very old one.

F. R., of Mass—Patent drawings may be signed by an inventor or his attorney. . . The process for making parchment paper is correct, with sulphuric acid and water equal parts. Your failure is probably due to using an unsuitable paper, or to using the acids too warm.

J. S. B., of Me.—The English monetary unit, the pound sterling equals in value 20 shillings, or 240 pence. Anciently 240 pence weighed a pound of silver; hence the origin of the term. Now, the equivalent weight of the pound is over three and one half Troy pounds. The signature, a pound sterling, is the initial letter of the Latin word "libra," a balance, the horizontal marks serving simply to distinguish this L from the ordinary letter. We have previously published a history of the dollar mark, and refer you back to that explanation.

F. S. B., of Conn., asks "why in the case of streams near their debouchure into the sea, the effect of the changing tides is first noticed on the sides of the river, so that near both banks a rising tide gives two up-currents while the main body of water is still running down and so *vice versa* when the tide changes." The momentum of the greater body of water which is in and near the channel of the river requires a longer time to be overcome than is the case with the shallower parts of the stream.

L. F. S., of N. J.—Entomologists divide the insect world into seven classes. the *orthoptera*, or insects having straight or longitudinal folding of their wings, and of which grasshoppers, cockroaches, and crickets are examples; the *hymenoptera*, or honey bearers, of which the bee forms a characteristic example; the *neuroptera*, or the order having, like the dragon fly, four membranous and transparent wings; the *lepidoptera*, insects with four membranaceous wings covered with fine imbricate scales like powder, as the butterfly; the *coleoptera*, or order to which the beetle family belong, all having crustaceous shells which when shut form a longitudinal suture along the back, and cover the wings which lie beneath; the *diptera*, having only two wings, and two poisers, as the house fly; and the *aptera*, or wingless insects.

Business and Personal.

The charge for insertion under this head is one dollar a line.

For Gas-Pipe Screwing and Cutting-off Machines for Hand or Power, or any tool used by Steam and Gas Fitters, address Camden Tool and Tube Works Co., Camden, N. J.

A Large Marble Factory to rent on the Hudson River. Address Davis' Machinery Yard, 124 Hudson st., Jersey City.

Wanted, address of parties wishing scale removed from boilers by Winans' Anti-Incrustation Powder, 11 Wall st., N. Y., 12 years' record's.

Wanted,—To be used in Elk county, Pa., a portable engine and boiler, of 30 horse-power, a circular saw mill, 30-foot carriage, planer, edger, shingle machine, and jack saw. Also, any other machinery connected with saw mill and tannery, if they are sold cheap. Address J. Schultz, Ellenville, Ulster county, N. Y.

One Third Interest in the Athens Foundery and Machine, Works for sale. Having an extensive collection of tools and patterns, a large circuit of custom, being in a healthy section of country, located among factories and mills. It is a desirable investment for a practical man. For full particulars address R. Nickerson, Agent, Athens, Ga.

Agents wanted everywhere—enormous profits. Sample doz. $1 50. Retail for $3 each. Thomas Powell, Milroy, Ind.

Parties in want of Fine Tools or Machinists' Supplies send for price list to Goodnow & Wightman, 23 Cornhill. Boston, Mass.

I will give a half-interest in a valuable invention to any one who will get it patented in Foreign Countries. A. Lake, Smith's Landing, Atlantic county, N. J.

For Paper Collar Machines and Bosom Plating Machines, address W. H. Tolhurst, Troy. N. Y.

Steel.—To Dealers and workers in Steel—A simple and reliable method of testing the quality and detecting the imperfections of steel, for sale. Price $1. Full instructions by return mail. Address P. O. Box 2,993, Boston, Mass.

Second-hand Barrel-head Rounder, with iron frame, in perfect order, for sale, price $100. Will make 4000 heads per day. Address Owen Redmond, Rochester, N. Y.

Parties wishing Machinery or Patents of any kind sold on Commission. Address Geo. P. Everhart, Shrewsbury, York county, Pa.

I wish to correspond with manufacturers who can build my Self Track-Laying Cars, Patented Jan. 22d, 1867. Address J. S. Lake, Smith's Landing, Atlantic county, N. J.

NEW PUBLICATIONS.

THE GALAXY.

The February number of this widely circulated and popular magazine comes to us laden with very choice original articles from the pens of a variety of well known and well paid contributors. Messrs. W. C. & F. P. Church, 39 Park Row, New York, are the publishers of the *Galaxy*, and also of the *Army and Navy Journal*—both first class publications in their respective line. The *Galaxy*, (monthly,) $3 50 a year. The *Army and Navy Journal* (weekly,) $6 00 per annum.

GEMMA—T. B. Peterson & Brother, Philadelphia, Pa. Price, bound, $2; paper, $1 50.

A Novel of 450 pages by T. A. Trollope. The *Athenæum* thus reviews it:—"Mr. Trollope again gives us one of his novels of Italian private life of the present day. The descriptions of the city of Siena—of the country around—of Savona, the desolate town of Maremma—are wonderfully graphic, and bear witness to their having been done from the life by one who has ved in the places and loved them. The scene in the great church of Savona is brought vividly before the reader, who will not easily shake off the impression it produces. We would recommend the reader to learn for himself the unravelling of the plot and the final result. The story will repay perusal and the interest increases as it proceeds."

DAVID COPPERFIELD—By Charles Dickens. Cheap edition, paper, 25c. T. B. Peterson & Bro., Philadelphia, Penn.

ATLANTIC MONTHLY—February number just out. Ticknor & Fields, Boston, Mass. $4 00 a year.

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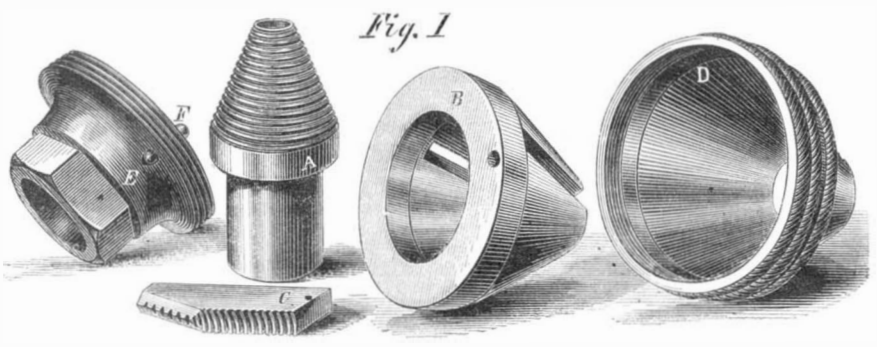
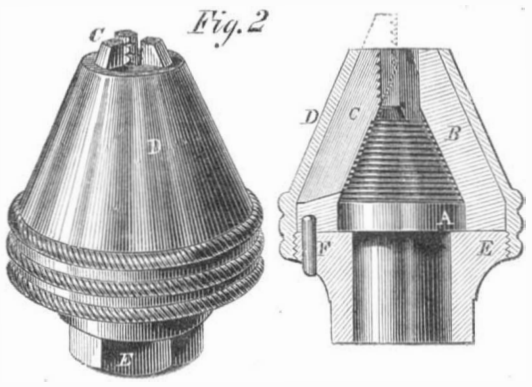
Improvement in Lathe Chucks.

The accompanying engravings give different views of a chuck for holding drills, wire, etc., in the lathe, which was patented by Isaac Smith, of New York, July 10, 1866. It differs in many respects from all others, employing no spring to open the jaws when the gripe of the screw is relaxed, all the movements being absolute. There are neither holes nor projections on the exterior case to become filled with dirt or to catch into the clothes of the workman. Fig. 1 exhibits perspective views of the different parts, and Fig. 2 a vertical section and a perspective of the chuck complete. A is the conical screw which gives motion to the jaws, having a shank for attachment to the lathe spindle. Over this slips a shell, B, having three or more slots in its periphery in which fit the movable jaws, C. These are threaded on the under side to fit the thread of the conical screw. The whole is





SMITH'S PATENT DRILL CHUCK.

covered by the case, D, held in place by the cap nut, E, which is connected to the slotted shell, B, by a pin or screw, F.

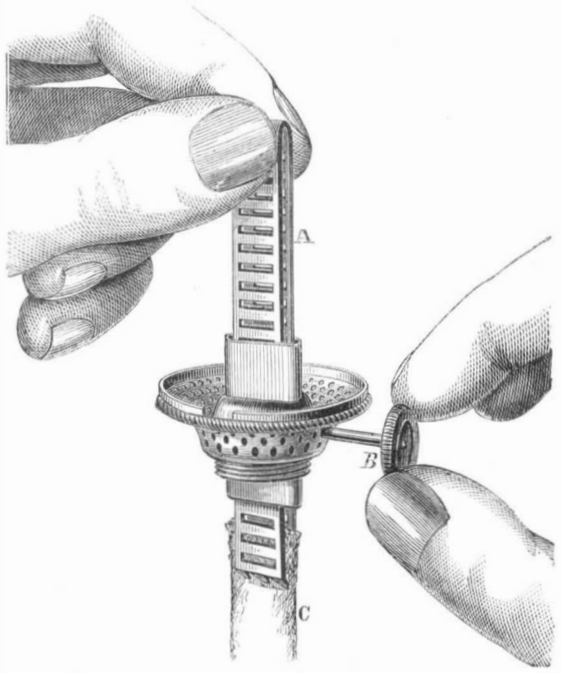
In operation the chuck may be turned with the hand, by means of the milled beading on the outer case, sufficiently hard to hold the drills, and if more force is required a wrench may be placed upon the nut, E. The chuck is very neat in appearance, and the jaws, whether open or closed, are always parallel.

This chuck is peculiarly adapted to screw making from wire, and to screw machinery, having a hole through its entire length as large as the opening of the jaws. Used upon a hollow lathe spindle wire of any length may be chucked for turning or screw cutting. It will receive a long or double drill, an advantage appreciated by all machinists.

All communications, orders, etc., should be addressed to the Excelsior Chuck Co., No. 10 Park Place, New York city.

BLAETTERLEIN'S DEVICE FOR INSERTING LAMP WICKS.

All who use kerosene or other lamps which require the flat wick, understand the difficulty of passing the wick through



the flattened tube. The difficulty is much increased if the stiffened end of the wick becomes frayed or softened. The simple device shown in the engraving will enable the clumsiest or most inexperienced to pass a wick through the tube. It is a strip, A, of sheet metal, punctured with transverse slots, calculated to engage with the teeth of the pinion or spur on the elevating shaft, B, and furnished with inward bent teeth at each end. The strip is bent or doubled at the middle, so that the teeth on the ends come opposite each other.

Its operation is thus: The threader, taken in the hand, is made, by its teeth, to grasp the end of the wick, C, and then the doubled end is passed into the tube from the bottom, when, by turning the elevating pinion, its teeth "take" in the slots of the threader until the wick engages, when, of course, the spurs take the wick and the threader can be removed. Its simplicity and utility will recommend itself to every housewife.

Patented through the Scientific American Patent Agency, Dec. 31, 1867, by F. A. Blaetterlein, to whom, at West Meriden, Conn., all communications relative thereto should be addressed.

Manufacture of Artificial Stone.

It has long been known that a mixture of sand, magnesia, and bittern water, a refuse of salt works which contains chloride of magnesium, will form a strong mortar, which soon hardens, and when molded into blocks makes a good artificial stone. Many forms of these mixtures have been made. D. and W. McCaine, of Groton, Mass., have recently patented the idea of using pulverized stone, brick, etc., instead of sand.

Blocks thus made are more costly, but not any better, apparently, than the previously made blocks. The patentees give the following particulars:—

"In the preparation of such stone, we use, as a cementitious agent or agents, calcined magnesia and bittern water, and our invention consists in an artificial stone, made by combining, with stone chips and finely pulverized or powdered stone, magnesia and 'bittern water,' the residuum from salt works.

"The proportions and the process of combination preferred by us are as follows: To twenty parts, by weight, of comminuted stone and chips of stone, we add about one part of calcined magnesia, and mix them together, with sufficient bittern water to form a stiff mortar, which mortar may be molded and pressed, or simply molded, or applied with a trowel.

"Heat may be used to hasten the hardening process; but this is not generally necessary, as the stone dries well in the open air, and indurates perfectly in two or three weeks, without any application of artificial heat.

"By this process, sand, soapstone, marble, or other mineral substances, in broken, pulverized, and comminuted form, may be used for the production of blocks and slabs, the invention being particularly valuable for the utilization of chips in stone quarries, and of marble, soap-stone, and slate stone dust and chips, in places where these minerals are worked. The stone so made answers perfectly for building purposes, for tiles, for stone sinks, stoves, etc., and, generally, the same purposes for which bricks, clay, and stone blocks and slabs are employed.

"The relative quantities of finely pulverized and of broken materials that are used depend somewhat upon the size of blocks that are to be formed; but it is only necessary for the producing of the stone that the mortar, made up of the pulverized stone and the calcined magnesia and bittern water, should fill all the interstices and spaces between the broken stones or chips."

Filling of Wood for Carriage Bodies, etc.

Many cheap methods of filling the pores of wood, prior to the application of paints, have been introduced. These fillings have the effect to keep the paints and varnishes upon the surface of the wood, where they solidify and form a very smooth and elegant surface. George Chambers, of Ithaca, N. Y., in a recent patent, says:—"To any convenient quantity of boiled linseed oil I add, over and above the ordinary drying use of the article, any free and large excess of litharge, and also a small quantity of chalk, or of chalk, and whiting, and starch. This makes a thick, glutinous semi-fluid mass. Next, the surface of the wood being cut, planed, or sandpapered, or otherwise smoothed or polished, but having no preparation or mixture of any kind on it, I coat it over with the above preparation, rubbing it freely into the pores and grain of the wood. Then I at once apply a thick dusting or coating over the wood thus covered with sulphate of lime or plaster of Paris. I let it stand for a few moments, that the fluid parts of the oil may be absorbed by the sulphate of lime. Then I proceed at once and polish the surface, using if necessary, more plaster of Paris in so doing. Brushes, woollen cloths, and other articles in rubbing and polishing, are used. Further, to suit the color of the wood, I use in my preparation, and in the plaster of Paris, various coloring substances, the mineral ores being especially useful, as Vandyke brown, umber, Spanish yellow for black walnut and oak, chalk and whiting (in additional quantities) for maple and cucumber and satin wood, and so of other colors and woods. These I mix in the preparation before it is applied to the wood, and, if necessary, in the plaster of Paris in polishing. The result is a fine, clear, even polish, that hardens, and is dry and ready for use, in much shorter time than varnish or other ordinary articles and modes."

THE ERUPTION OF VESUVIUS.—Professor Palmieri, of Naples, who is engaged in making observations in all phenomena connected with the last fire outbreak of this volcano, states that he has never seen the magnetic needle so frequently or seriously disturbed as it is at present, and the seismometer records at least ten distinct earthquake shocks daily.

HOW TO HAVE WARM FEET.—It is said that the wearing of cotton stockings under woolen ones will prevent cold feet. It no doubt will when caused by moisture. The woolen stockings will absorb the moisture as it accumulates in the cotton sock, and keep the latter comparatively dry. But when the cold arises from the lack of circulation, the woolen sock will be found the most comfortable worn next to the foot.

Recipes for Steel Having Various Qualities.

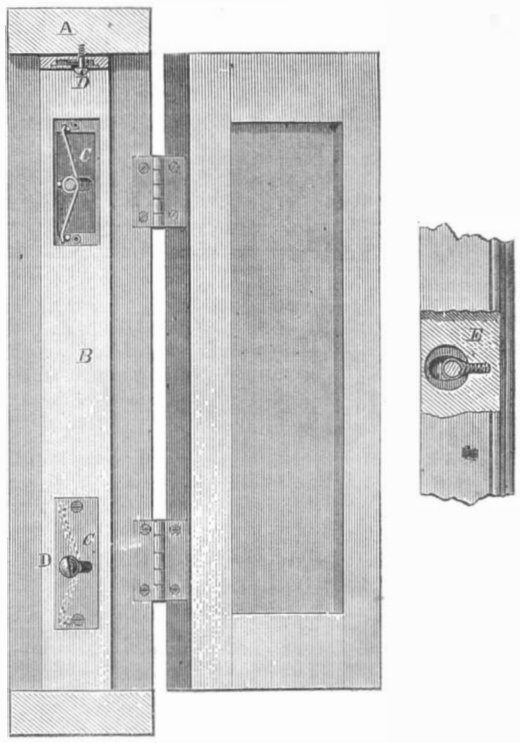
James R. Bradley and Moses D. Brown, of Chicago, Ill., have lately patented the following:—

"For treating scrap iron or malleable iron of good quality, produced by the ordinary processes, and producing therefrom different kinds of steel, we melt the scrap or malleable iron in crucibles, adding thereto chemical ingredients of different properties, and in different proportions, as follows, to wit: To make shear steel, to a pot of 50 pounds, add potash, 1¼ ounce; sal-ammoniac, 1½ ounce; manganese, 4½ ounces; charcoal, 7 ounces; sodium, 3 ounces. To make cast steel, to a pot of 50 pounds, add potash, 1½ ounce; sal-ammonia, 1½ ounce; manganese, 4¼ ounces; rock salt, 3¼ ounces; charcoal, 7 ounces. To make German steel, to a pot of 50 pounds, add potash, 1½ ounce; sal-ammoniac, 1½ ounce; manganese, 4½ ounces; charcoal, 7 ounces. To make Damascus steel, to a pot of 50 pounds, add potash, 1⅜ ounce; sal-ammoniac, 1¾ ounces; manganese, 5 ounces; saltpeter, 4 ounces; charcoal, 7 ounces. To make saw steel, to a pot of 50 pounds, add potash, 1¼ ounce; sal-ammoniac, 1½ ounce; manganese, 4½ ounces; charcoal, 8½ ounces: common salt, 3½ ounces; saltpeter, 1 ounce. To make silver steel, to a pot of 50 pounds, add potash, 1½ ounce; sal ammoniac, 1¾ ounce; manganese, 4⅜ ounces; charcoal, 8 ounces; salt, 3½ ounces; alum, 1 ounce. To make file steel, to a pot of 50 pounds, add potash, 1 ounce; sal-ammoniac, ⅜ ounce; manganese, 4 ounces; charcoal, 9 ounces; salt, 3½ ounces; alum, ¼ ounce. To make rifle steel, to a pot of 50 pounds, add potash, ¾ ounce; manganese, 4 ounces; charcoal, 3½ ounces; salt, 3 ounces; alum.

"What we claim, as new, is—The improved processes for making steel of different kinds herein described, by mixing the several ingredients in the proportions, and melting the same with malleable or scrap iron, as specified."

BUTLER & WARING'S WEATHER STRIP FOR DOORS AND WINDOWS.

Slamming doors and rattling windows are annoying to the strong and healthy as well as to the nervous and feeble; and ventilation by ill-fitting sashes and doors is neither healthy nor economical. The engraving represents a self-acting or automatic weather strip which is cheap, durable, not liable to derangement, and can be easily applied. It is a simple strip of wood secured to the inside of the window sash, or door



jamb, by screws through slots, the strip being held in place by springs.

A, in the engraving, is the section of a door or window frame, and B is the weather strip. A plate, C, mortised into the strip, has a transverse slot through its center through which the screw, D, passes, engaging with the elliptic spring under the plate. As will be seen, when the door comes in contact with the edge of the strip the springs allow the strip to recede and yet holds it snugly against the door. Its action on window sashes is similar. The strip may be carried up both sides of a door or window and across top and bottom without adding perceptibly to the labor of closing. The small figure, E, shows a simpler form of the spring and plate, the first being simply a spiral and the latter a washer under the head of the screw.

It is evident from the description and engraving that this strip is very simple. Any other form or material of spring may be used, as deemed desirable. The patent—secured through the Scientific American Patent Agency—is dated June 4, 1867. Rights are for sale by Butler & Waring, who may be addressed, Box 119, Hudson, N. Y.

IN taking up belts the time used in carefully cutting the belt square is always time saved.

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WASTE OF OIL IN SHOPS AND MANUFACTORIES.

It is doubtful if either employers or employés in our manufactories have an adequate idea of the amount of lubricating oil which is sheerly and heedlessly wasted in the different processes of iron, cotton, woolen, and other manufactures. But employers know well that their bill for oil bears a large proportion to their other expenses. It is not likely that employés, generally, wantonly waste the property of those by whom they are employed, but the probable fact is that there is a want of consideration or a lack of knowledge as to the proper use of the material.

Take the machine shop for instance. It would not be extravagant to assert that fully one half the oil ostensibly used in shops is really wasted. If a workman wishes to oil his file for finishing he will pour a stream over its surface, allowing two-thirds or more to drip on the floor, when the file could be sufficiently moistened by a small bunch of waste, or better, a small sponge saturated with oil, without wasting a drop. Some workmen in machine shops seem to think that their status as workmen depends on the amount of "gurry" and oil they can carry about on their persons, so that they may be considered "greasy mechanics" *par excellence*. We believe that it is not necessary for a machinist to be repulsive because of grease on his person; although a finical workman is abhorrent—one who pays more attention to his personal appearance than to his legitimate work.

If a hole is to be tapped in iron, whether cast or wrought, the workman too often prefers lubricating oil to patience and "elbow grease," and pours on the oil until he saturates the substance or fills the pores of the iron. In ordinary cast iron, a tap, properly made and judiciously used, can be run without oil, or with a very small quantity, and in this work, as in many other processes, a saponaceous liquid is equally as effectual and much cheaper. It is an old and worn-out notion that almost every operation on the metals, and almost every use of a tool, must be accompanied with oil; neither is it correct that oil alone is a lubricant. Holes *may* be drilled and tapped and surfaces finished without the use of oil, although some lubricant may be necessary. The addition of oil to an already clogged file, milling tool, saw, or rotary cutter is not only a waste, but is no aid to the progress of the work. Either of them may be quickly and effectually cleaned either by wiping with waste, combing with the card, or heating over the forge fire; when they will do the work required much better than if they had to overcome the resistance of a body of viscid oil.

In the lubricating of shafting, also, great waste is occasioned. Where shafting is suspended in ordinary boxes most of the oil leaves the journal almost as soon as poured into the box, and finds its way, dirty and fouled, into the dripper; once there it is nearly worthless for shop use. Gummy, dirty oil, charged with foreign matter, and half oxidized by exposure to the atmosphere, although often used for tapping and screw cutting, is unfit for even these purposes. It corrodes the taps and dies, and by its adhesive quality, adds greatly to the power required to do the work.

Journal boxes are now made which retain the oil and require replenishing only three or four times a year. Their additional cost over the old style is but trifling, and their use will save a large expenditure. They should be adopted by every "live" mechanic. Pouring oil on heated journals is wasteful; water is much better. Indeed, water is an excellent lubricant so long as it remains in place between the journal and box. If, like oil, it could be kept there, it would afford one of the best means of lubrication. Oil after passing between a heated journal and box is comparatively worthless for lubricating purposes.

These considerations, crudely presented, may serve to direct the attention of our mechanics to a subject well worthy of notice; the qualities of oil, its changes under different circumstances, and its substitutes, comprise a subject of very great importance, on which all managers and workers of machinery should have some theoretical as well as practical knowledge.

SPONTANEOUS COMBUSTION.

It may be that some fires now attributed to the wickedness of human incendiaries might be found to have their origin in the operation of natural laws, and that their attribution to other causes is merely the result of our ignorance of those laws. Spontaneous combustion is undoubtedly a prolific source of fires. This is produced in various ways. It is well known that a spongy, fibrous substance, as cotton waste, or tow, saturated with linseed oil, if exposed sufficiently long to the sun's rays, or even the atmosphere, will take fire. Authenticated instances of destructive fires originating in buildings where rags or cotton waste were stored, are sufficiently numerous to prove the impropriety of keeping these substances piled in mass a long time. Factory waste is always more or less saturated with oil, which oxidizes on exposure to the atmosphere and gives out carbonic acid and hydrogen. If the waste is in quantity sufficient to compress the fibers, the danger of fire by the accumulation of heat is considerably increased.

Bituminous coal in large heaps oxidizes, and undergoes always a slow combustion without being inflamed; but sometimes, when wet by frequent rains, the coal actually takes fire. This is aided by the sulphuret of iron generally contained in bituminous coal.

Quicklime absorbs water so rapidly that sufficient heat is developed to ignite inflammable substances when brought in contact with it. It is therefore a dangerous commodity to store where there is a possibility of its being exposed to moisture, and its carriage by water is always attended with risk.

Newly burned charcoal in mass is liable to absorb moisture so rapidly as to produce ignition; so, also, it is asserted on good authority that wood ashes will ignite spontaneously without the presence of live coals.

It may not be commonly known that iron borings, turnings, and filings are also dangerous when left in heaps or stored in boxes. They are always wet, especially where they have been allowed to remain under lathes upon which water polishing has been performed. We have seen a heap of this material burning with an intensely blue flame. The oily waste, which is not unfrequently thrown into the iron shavings, adds greatly to the danger of fire from this source. The sweepings of the machine shop, if kept on hand, should never be placed in a wooden box or left in the shop.

A knowledge of these simple facts, combined with ordinary care, may prevent the occurrence of some fires which are now deemed mysterious in their origin.

WHAT SHALL BE DONE WITH OUR BOYS?

A correspondent of the Washington *Chronicle* writes to the editor of that journal as follows:

"I wish to call your attention to a great wrong that is now being inflicted on the boys of the present generation. I allude to the difficulty—I might say impossibility—of putting boys to trades. Several instances have recently come to my knowledge of parents in this city trying in vain to apprentice their boys to mechanical occupations. In these endeavors they are invariably told that the rules of the journeymen prevent master mechanics taking apprentices beyond a very limited number. That number every employer within my knowledge already possesses, and still it can be safely said that there are hundreds of boys at present in Washington unable to learn occupations that would enable them to earn respectable livings during their minority, and become useful citizens afterward. What is to become of these boys? Have we any right to interpose obstacles to their efforts to become good and useful men? and will it be any wonder if, in a few years, many of them are useless, or worse than useless, members of society?

"I believe fully in the right of mechanics to regulate their wages and hours of labor; but I do not believe in any of their laws that virtually tell a widow that she shall not bring up her son to the business that son may choose to earn a living at, by which he can support his mother in her declining years.

"This is no fancy sketch, Mr. Editor; and to prove it I refer to any employer to endorse my statement. You will see yourself the inevitable evil that must spring from a continuance of such a state of things. If any master tradesman in this city were to advertise for an apprentice to-morrow, I believe he would have at least fifty applicants for the situation before night. Should this statement be doubted, let the experiment be tried."

We copy the above simply to call the attention of employers, mechanics, and our readers generally, to a state of affairs which is in no wise overdrawn in the letter of the correspondent. We frequently have applications from parents and from young men for counsel or assistance in this matter, and always experience the same difficulty of which the correspondent speaks; the proprietors of our shops evincing considerable reluctance to receiving apprentices. It may be possible that in some localities the journeymen, as the writer intimates, may assume to dictate to their employers as to the number of apprentices they may receive; but we doubt if the practice is very general.

It is not American, and we hope is not in danger of becoming naturalized in this country. We recollect, twenty-five years ago, when the business of designing and engraving for calico printers was almost entirely in the hands of foreigners, that the rules of their trades union prescribed the number of apprentices to be received, thereby often proscribing the would-be apprentice. At that time these employments were highly remunerative, as compared with others, and it was not surprising that those who had served a long apprenticeship and paid for their knowledge should desire to protect themselves and their business. It is not an easy matter, in England, for a young man or boy to become an entered apprentice to any mechanical business. They, or their parents or guardians, are compelled to pay a bonus for the privilege of being taught a trade; and in addition seven, instead of as in this country, three, or at most, five years, is exacted as the term of novitiate. Under these circumstances the apprentice and the journeyman set an adequate value upon the skill they have attained.

Possibly a portion of the difficulty of procuring positions for apprentices is caused by the want of honor among apprentices themselves, and the impossibility of protection to the employer under the loose system, or rather want of system, so prevalent here. Too often apprentices leave their masters soon as they have attained sufficient expertness and knowledge of the use of tools to be of some profit to their employers. If some system were generally adopted which would adequately protect employers, binding the apprentice to the performance of his portion of the contract, it would not be so hard a matter to secure situations as at present. Something, however, should be done to give our boys greater opportunities to become practical mechanics. The ratio of apprentices in most shops is not nearly what it should be, yet to these we must look for the successors of our present workmen.

TUNGSTEN AND TUNGSTEN STEEL.

The metal tungsten is found in small quantities in the form of tungstic acid combined with lime, in the mineral known as *Scheelite*, also in the tungstate of iron and manganese, a mineral known as *Wolfram*, and in the tungstate of lead, or *Scheelenite*. Both wolfram and scheelite are found in the United States, the former at Lane's Mine, Monroe county, near Mine La Motte, Mo, and near Blue Hill Bay, Me.; the latter has been met with at Monroe and Huntington, Conn., associated with wolfram pyrites and native bismuth in quartz. Tungsten was first obtained in the metallic state by the brothers D'Elhuyar, Spaniards, in 1783. In communicating their results to the Academy of Sciences at Toulouse, they described the alloys of the tungsten with gold, platinum, copper, lead, tin, antimony, bismuth, zinc, manganese, and white cast iron, not, however, with malleable iron or steel. All they state in regard to the iron alloy is that "with white cast iron it formed a perfect button, of which the fracture was compact and grayish white; it was hard and easily broken."

Tungsten fuses easily before the oxy-hydrogen blowpipe, but then the larger part burns to tungstic acid. Mr. Riche has succeeded in melting tungsten by means of a current from a battery of 200 Bunsen cells. In reducing tungstate of ammonia in a current of hydrogen gas at red heat, Percy obtained the metal in the crystalline state, with tin white color and bright metallic luster. The specific gravity of the metal ranges from 17·22 to 17·6. It is very hard, a file scarcely scratching it. It is less readily fusible than manganese, and exhibits either a tin white, steel gray, or grayish white color, according to the manner of its preparation.

We are indebted to the Duc de Luynes for a memoir on the manufacture of cast and damask steel, and in nine analyses therein published of various kinds of this celebrated steel, tungsten appears in eight. In six of these, only traces of that metal were met with, while of the other two, one contained one half and the other exactly one per cent. The quality of that highly estimated steel could then, according to these statements, scarcely be attributed to its amount of tungsten, for from one to three per cent of this metal produces but little change in the iron.

Some highly important experiments were made some years since by Bernoulli at the royal foundery in Berlin. We will in a few lines present a short abstract of his report which may be found in the "Annalen d'Physik u Chemie" of Toggendorff. Cast iron fused in various proportions with tungstic acid gave the following results:

"With from 4 to 5 per cent a slight change was perceptible in the iron; not so with from 1 to 3 per cent. With 10 per cent the iron acquired steel-like properties, it was of a light grayish color and possessed an extremely fine-grained, somewhat conchoidal fracture. It was also found to be a little malleable. An alloy of 15 parts of the metal with 85 parts of iron formed almost pure steel, but of little malleability. With 20 per cent it grew still harder and less malleable, and beyond this limit the deterioration in these respects increased until with 50 per cent it can no longer be hammered. A similar series of experiments was made in fusing tungstic acid with white cast iron, but no alloy was produced except when charcoal powder was added.

The conclusions at which Bernoulli arrived are that only the graphite or mechanically-combined carbon in cast iron can reduce tungstic acid, and the combined carbon has no such effect; by melting gray cast iron with a suitable proportion of tungstic acid, cast steel may be directly produced.

Tungsten steel was first made on a large scale in Austria, and was exhibited in 1858 in Vienna in various forms, at the Congress of miners and melters. The steel was remarkably fine, uniform, compact, and of a conchoidal fracture. Swords exhibited were sharp, hard, tough, and elastic. At the international exhibition of 1862 such steel was exhibited, but did not attract much notice. Lately, however, a trial with tungsten steel has been made in Westphalia and elsewhere, and the general conclusion has been arrived at, that tungsten steel furnishes much more advantageous results than the best cast steel employed at the present time in commerce.

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There is much tungsten steel sold to consumers in which there is not a trace of this metal. Dr. Feuchtwanger exhibited lately at the Polytechnic Association of the American Institute a tungsten ore from Nevada, occurring there in heavy beds, and Prof. Van der Weyde showed a steel knife containing tungsten, which cut glass readily like a diamond.

European and American Locomotives.

A writer in the London *Herald*, comparing different kinds of railway apparatus, gives the following interesting account of some of the peculiarities of European and American locomotives:—

"In England, we see the locomotive engineers, as a general rule, aiming at high speed, as little complication as possible in the parts of the engine, utmost simplicity in all things, perfection of adjustment and workmanship, and high boiler pressure. Upon this last point we may note that a few years since fifty pounds to the inch was considered high; now one hundred and twenty pounds and one hundred and thirty pounds are ordinary pressure, and on the North London line engines are being run at one hundred and eighty pounds.

"France has slow speed and very heavy trains; her engineers aim at large tractive force, do not spare complication, use large quantities of material, and couple numbers of driving wheels together, making, for example, twelve-wheeled coupled engines, things utterly unknown in England, but at the same time they put light weight on those wheels, not more, in fact, than ten or twelve tuns on an axle. The French deserve credit for having developed their engines into a form suitable for their shareholders's ideas of traffic, that is, a heavy engine at slow speed pulling a long load. One expensive necessity has already been evolved in our own country by the quick running of small trains, namely, the necessity for laying down third and fourth lines of rails to accommodate the traffic, at an enormous expense to the proprietary, and which could have been avoided if the trains had been worked as on the Great Northern of France. The fuel for a heavy train is much the same as for a light one, or very little increased; but in running double sets of trains over double lines of rails, the wages are doubled, the first cost—that is, line accommodation—is doubled, the number of engines is doubled, while the wear of engines and road is quadrupled.

"The American idea is cheap engines. Their locomotives have their parts very accessible, and they run them at fair but not high speeds. The American engines have special arrangements for clearing and lighting the road, and for burning wood in their furnaces. Notwithstanding the superiority of English made engines, not one of them can run over American lines with any thing like the speed, safety, or endurance of their own. Strange as this may at first appear, it is easily accounted for, and the explanation bears on the points we shall presently bring forward. The explanation is, that the leading ends of the American engines are supported on four-wheeled trucks, or bogies, which, while giving a long wheel-base, and consequently steadiness, allow the engine to travel on exceedingly bad roads, and to traverse sharp curves with ease and security.

"The German engines go even slower than the French. The quickest French lines are those from Lyons to Paris, and from Paris to Calais. The proportions of parts of all the foreign engines—particularly the German—were very bad. For instance, the cranks in many cases had double the quantity of material necessary for the strength required, and this extra portion so disposed as to be a perpetual stumbling weight in their revolutions. Of the Italian lines we know of nothing specific to be said.

"The Belgians run their engines at speeds intermediate between the German and French; they follow a medium of English and French make in their construction, and their lines contrast favorably in their working with many others on the continent. This may be attributed to their being under the general superintendence of an Englishman, Mr. Cabrey.

"The Russians are much the same as the Germans. The engines are mostly of English type, in some cases a cross between the English and American."

Diamonds---Their Utilities.

The popular taste for diamonds, above all other jewels, has lately become a striking American peculiarity, but it is being followed at the present time by the middle classes of the rest of the world. From very ancient times the hardness and brilliancy of these precious stones have been observed and prized most highly, but it is only within the last three or four hundred years that the estimate of them has risen to anything like the present mark. Almost every year the demand for them increases beyond the supply. Gold is found in greater abundance, but diamonds are relatively scarcer. It is not their intrinsic worth or applicability to purposes of varied usefulness, that creates the demand for them. Their brilliancy, scarcity, purity, and hardness, form the foundation of their price. They are crystals formed of pure carbon, and capable of being consumed under sufficient heat, leaving no residuum except carbonic acid gas. Brazil is now the most celebrated market for diamonds, and great are the precautions taken at the mines where they are found to prevent peculation; but Golconda, Viaspour, Borneo, and Bengal used to be celebrated for their diamond mines, the last named being of the most ancient renown. At the commencement of our late war, when property was thought to be particularly uncertain, large investments were made in diamonds, and large numbers were brought over from Europe. Jeffries supposes the value of these stones, when in the rough state, to be, on an average, about ten dollars per carat at a medium. But, then, to find the value of diamonds of greater size, it has been said we should mutiply the square of their weights by two, and the product will be the value required. Thus the square of the weight of a rough diamond of two carets would be four, which, doubled, would be sixteen pounds sterling, or eighty dollars.

In 1837, the Nassuch diamond, a part of the Deccan booty, was sold in London for only seven thousand two hundred pounds, though it weighed 357½ grains, and was of the purest water. But in December, 1858, a diamond weighing sixty-one carats brought thirty-three thousand pounds, and a pair of drop-shaped stones for ear rings brought fifteen thousand pounds. The largest diamond known is that owned by the king of Portugal. It weighs 1680 carets. But that which has attracted the most attention in recent times, is the Koh-i-noor, or Mountain of Light, now one of the jewels of the Queen of England. It was found before the Christian era, according to tradition, in the mines at Golconda, but, in the fourteenth century, was added to the treasures of Delhi. On the annexation of the Punjaub to the East India Company's territory, it passed, not without strong coercion, however, into the possession of the Queen of England. It weighs, after being re-cut, 186 carets, and is, therefore, smaller now than the Orloff diamond, purchased by Queen Catharine of Russia, which weighs 195 carats, and is about the size of a pigeon's egg. This last was, probably, stolen by a French deserter from a famous idol at Pondicherry, and was finally sold to the Queen for four hundred and fifty thousand dollars, and an annuity of twenty thousand dollars, together with a title to nobility.

The process of collecting diamonds in Brazil is similar to that of collecting gold in the alluvial deposits. A stream of water is admitted into a long box, in which the gravel is washed by negroes. He who finds a diamond weighing as much as 17½ carats, is liberated. Some years ago a negro seeking for diamonds in the bed of a river, broke with his iron bar through a crust of sillicious matter, in which he discovered a bed of diamonds that afterwards sold for $1,500,000. Being carried to England, it fairly broke down the market for the time. Small, irregular and imperfect diamonds are crushed in steel mortars, while the splinters are made into drills. The dust is very valuable for cutting and polishing other diamonds and jewels, while the drills are used for piercing small holes through sapphires, rubies, and other hard stones, especially for watches. There is a general feeling that more scientific attention might yet be profitably employed upon the diamond; not, perhaps, in the manufacture of artificial stones—this hardly can become remunerative—but as to their origin, the process of their formation, and, above all, the uses to which they can be profitably put, much remains yet to be ascertained.—*Phil. Ledger.*

Portrait Figures with Natural Landscapes.

I observe that considerable interest has been of late excited by some prints in which portrait figures have been combined with well-executed landscapes, with a perfect union of the full form. The following idea may or may not be that employed by the maker of the prints in question; but it would, I think, undoubtedly yield better results than the methods commonly in use, and, in some respects at least, with less labor. I give it for what it may be worth, not having had leisure to make any experiments myself:—

Provide some pieces of glass and of mica of exactly the same size as the glass. Pose the model, supposed to be a standing figure (or any number of standing figures—it being one great merit in this plan that a whole group may be introduced into the landscape with no more trouble than a single figure), against a black background and *upon a black floor*, and take the portrait (or the group) on a piece of mica. After fixing and varnishing, apply some thick water color on the back of the mica, behind all the transparent parts of the figure. Outside of the figures all of course will be transparent; this is the object of having a black background and black floor.

Now select any view at pleasure. This may be a natural view, or an engraving, or a photographed view on paper (*i. e.* a positive paper print). Prepare one of the pieces of glass as a dry plate. Put it in the dark slide with *the mica portrait in front of it*, and so expose at the view, engraving, or photograph. Take off the mica, develope the plate, fix, and varnish. There will then be obtained a landscape negative with blanks exactly corresponding to the figures. Then attach firmly to it the mica plate, first, of course, cleaning off the color previously applied on the back of the mica behind the transparent parts of the figures. In attaching the mica, the figures must be made exactly to correspond with the blanks, and then it is cemented fast.

I think it will be seen at a glance that this method offers some striking advantages over any of the usual plans—especially in this, that the result is not two negatives to be printed with the utmost care into each other, but a compound negative that any tyro can print as easily as an ordinary one.

The atmospheric effects in the print, supposed to be got by faintly and delicately shaded backgrounds, are probably caused by the faint light which comes even from a black background; and, as more of this light is reflected from the upper part of any screen than the lower, this would exactly cause the atmospheric effect spoken of, by throwing a slight haze over the upper part of the picture. At any rate, this effect could be increased as much as might be desired, if found insufficient.

This idea of a double negative, the front piece consisting of a transparent piece of mica carrying the figures, is, I believe, entirely new, and, in ingenious hands, might be made to produce a variety of interesting effects, especially in the combinations of objects which cannot, with portrait lenses, be brought simultaneously into focus—with the advantage, too, of perfect simplicity and ease in the printing.—M. CAREY LEA in the *British Journal of Photography.*

[The use of mica as proposed by Dr. Lea may be new, but the taking of portraits with special backgrounds is quite old. We have seen equestrian photographs beautifully done in this way. The photographer arranges in his studio a wooden rail of the right hight, on which a side-saddle is placed, and the lady, dressed in equestrian costume, mounts, takes position as in riding, and is duly photographed. A paper print of this negative is then made, out of which her figure is carefully cut, blacked and pasted upon the engraving of any handsome steed that the lady choses to select. A negative of the horse is then made which has a blank space corresponding to the figure of the lady. Two printings are required to produce the picture; one from the negative of the lady, the other from that of the horse. Instead of engravings, photographs from living animals may be used.—EDS.

Sponge for Textile Fabrics.

A. Paraf, of Mulhouse, France, has lately obtained a patent in this country, in which we find the following:

"The best quality of sponge is gathered in the Mediterranean sea; but an excellent quality, as well as an inexhaustible quantity is found upon the rocks of the Bahamas and the coast of Florida. The spongs, when torn from the rocks to which it adheres, appears at first as a heavy black-looking mass, having a strong and offensive odor. In order to clean the sponge, it is buried in the earth for some weeks, at the end of which time all the organic matter will be decomposed, only the pure fibrous skeleton remaining.

"The sponge, when purified, is liable to become exceedingly hard, and, therefore, unfit to be used as a material for weaving cloth. To obviate this, I first take the purified sponge, and immerse it in water containing from ten to twenty per cent of glycerin, then squeeze it dry, after which it will be entirely soft and elastic. It is then cut into small pieces, and put through the carding process, and then felted. Only certain qualities of sponge are capable of being spun. One of them is the kind known as "chipoul," which has comparatively a long fiber. The felted sponge may be used for hat bodies, carpets, etc., the sponge cloth for clothing, etc.

"Sponge thus prepared may be worked in the preparation of fibrous and textile fabric, with or without the admixture of other ingredients or fibers; for instance, it can be used to advantage in connection with woollen and other similar substances."

Deodorizing and Perfuming India-Rubber, Gutta-Percha, etc.

In a recent patent of Edward de la Granja, of Boston, he says:—"I have invented a new and useful improvement in deodorizing and perfuming india-rubber and gutta-percha. I steep or macerate the rubber or percha, in a solution of iodine, permanganate of potash, iodide of potassium, glycerin, sulphite of soda, sulphite of lime, sulphite of potassa, and water. This macerating process I carry out for twenty-four hours in a close earthen or china vessel, the solution being all the time cold. At the end of the twenty-four hours, I gradually heat the solution containing the rubber or percha, in the same earthen or china vessel, until it reaches the boiling point, at which degree of heat I keep the solution, uncovering the vessel, until one eighth part of it is lost by evaporation. Then I allow the mixture to remain in the solution until it becomes quite cold, when I take it out and expose it to a current of fresh air. Having thus deodorized the rubber or percha, I perfume it if desired by subjecting it to a dry heat below the melting point, and steeping it while hot in an aqueous or alcoholic aromatic solution of any desired strength, and perfumed *ad libitum.*

"The elementary proportions of the solution for deodorizing india-rubber and gutta percha are, iodine, fifteen grains; permanganate of potassa, twenty-four grains; iodide of potassium, sixty grains; glycerin, four ounces; sulphite of soda, four ounces; sulphite of lime, four ounces; sulphite of potassa, four ounces; water, one gallon and a half to two gallons."

[The above is a queer mixture of chemicals, the effect of some of them being neutralized by others.—EDS.

Fun at Home.

The *New England Farmer*, published in Boston, contains every week sensible hints for family rule and life. The annexed article on home amusements is worthy of regard by the heads of families everywhere:

"Don't be afraid of a little fun at home, good people! Don't shut up your house lest the sun should fade your carpets and your hearts; lest a hearty laugh shake down some of the musty old cobwebs there. If you want to ruin your sons, let them think that all mirth and social enjoyment must be left on the threshhold without, when they come home at night. When once a home is regarded as only a place to eat, drink, and sleep in, the work is begun that ends in gambling houses and reckless degradation. Young people must have fun and relaxation somewhere; if they do not find it at their own hearthstones, it will be sought at other and perhaps less profitable places. Therefore let the fire burn brightly at night, and make the homestead delightful with all those little arts that parents so perfectly understand. Don't repress the buoyant spirit of your children. Half an hour of merriment, round the lamp and firelight of a home, blots out the remembrance of many a care and annoyance during the day; and the best safeguard they can take with them into the world is the unseen influence of a bright little domestic sanctum."

THE new railroad from Logansport to Union City, Ind., 92 miles in length, has only four curves on the entire line. It forms the connecting link in a new through route from Chicago to the Atlantic cities.

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OFFICIAL REPORT OF PATENTS AND CLAIMS

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73,427.—ARTIFICIAL LEATHER BELTING.—Stephen M. Allen, Woburn, Mass.

I claim, 1st, A new artificial leather belting and banding for driving machinery, made by combining tanned and untanned scraps of skins or hides, after preparation, with vegetable fiber, pulped and run off into sheets, substantially in the manner and for the purposes herein set forth.

2d, As a new article of manufacture, belting and banding for driving machinery, made by combining tanned and untanned animal fiber with vegetable fiber, and by the further combination of bullock's blood or fibrine, the same being manufactured substantially as and for the purposes above described.

73,428.—MORTISING MACHINE.—Cornelius Baggerman, and John Green, St. Louis, Mo.

We claim the combination of the sliding chisel arbors, C C', the sliding holders, E, the cam rods, d, the connecting rods, d1, the cam wheel, D, and the cams. E, constructed and operating substantially as described.

73,429.—MANUFACTURE OF PAPER PULP.—Hippolyte Emile Baillière, Hoboken, N. J., assignor to American Fiber Company.

I claim a fiber for the manufacture of paper, etc., produced from disintegrated bamboo, substantially as described.

73,430.—WATER METER.—Phinehas Ball, Worcester, Mass.

I claim, 1st, The hollow piston P, in combination with the valve, bar, or rod, T, arranged to slide within said piston, substantially as and for the purposes set forth.

2d, The spring, S S, or other equivalent device, compressed by the power acting upon the piston within the cylinder, so that when they reach the central line of equipoise, they react and release the valve, substantially as set forth.

3d, The combination of the springs and valve, bar, or rod, with the valve and gearing, or racks for actuating the same, under such an arrangement that the compression of said springs shall take place partially or wholly during the time the valve remains at rest, substantially as set forth.

4th, The arrangement of the adjusting rod, l, within the valve, bar, or rod, T, whereby the length of the stroke of the piston is readily adjusted, substantially as set forth.

5th, The combination of the angular valve V, and ports formed in the cylinder case as described, of the piston, valve rod, springs, and gearing, for actuating said valve, substantially as and for the purposes set forth.

73,431.—SCREW-CUTTING TOOL.—Edgar B. Beach, West Meriden, Conn.

I claim the cutter, A, provided with the flange, B, attached to one side of a shank, substantially in the manner herein set forth.

72,432.—REIN SNAP.—Wm. H. Benham, New Haven, Conn.

I claim, 1st, The spring snap described, having a lever or arm, C, actuated by a spring, E, and liberated by pulling on the rein, adapted to serve in the manner and for the purpose herein set forth.

2d, In connection with the above, the employment of one or more fixed hooks, B1 B2, arranged relatively to the casing, B, arm, C, spring, E, and the locking piece, D, substantially in the manner and for the purpose herein set forth.

3d, In combination with the driving rein or its equivalent, the employment of the spring snap, substantially of the character herein represented, and adapted to be liberated by the movement of the rein or its equivalent, substantially in the manner and for the purpose set forth herein.

73,433.—BRICK-DRYING APPARATUS.—John K. Caldwell, Allegheny city, Pa.

I claim, 1st, The arrangement of a coil of pipe, i, over the fire space of the furnace of a drying house or oven, substantially as and for the purposes hereinbefore set forth.

2d, A furnace, so constructed with double walls, as to have a chamber, m, such chamber being furnished with registers, n, or other equivalent device for admitting air, and opening, by any suitable apertures, into the drying house or oven, substantially as and for the purposes hereinbefore set forth.

3d, The ventilators, g, so arranged, relative to the hot air chamber, m, and coil or coils of pipe, i, as to secure a current or draught of air therefrom through the drying house or oven, substantially as and for the purposes hereinbefore set forth.

73,434.—COMPOUND FOR PAVEMENTS.—J. C. Campbell, and M. V. Campbell, Syracuse, N. Y.

We claim the within compound of gravel, coal ashes, ground charcoal, ground plaster, cast iron fillings or borings, and coal tar, as and for the purpose set forth.

73,435.—CORK PULL.—Seth E. Clapp, Cambridge, assignor to himself and George P. Clapp, Boston, Mass.

I claim the combination of the spear, B B', with the sleeve, C, and the grappling prongs, H H' H'', substantially as described, and for the purpose set forth.

73,436.—GRATE BAR FOR FURNACES.—George H. Clarke, Brooklyn, assignor to the Salamander Grate Bar Company, New York city.

I claim the arrangement of the locking rod, B, and recess, C, in combination with the interlocking bar, A, the whole constructed and operating as set forth and specified.

73,437.—MANUFACTURE OF HOES.—William T. Clement, Northampton, Mass.

I claim the within-described method of manufacturing hoes, consisting in the production of wrought iron eyes, B B', and previously prepared blades, A A', and in welding them together in the manner substantially as herein set forth.

73,438.—CARRIAGE PERCH.—William H. Cooper, and George Gregory (assignors to Lawrence Bradley and Pardee), New Haven, Conn.

We claim the attachment of the perch, D, to the body forward of the wheel house, in the manner substantially as herein set forth.

73,439.—DEVICE FOR LEAKY BOILER TUBES.—Robert Avis Copeland, Baltimore, Md.

I claim the flange, A, screw bolt, C, and expanding nut, B, constructed and arranged substantially as herein set forth.

73,440.—CORSET SPRING.—Thomas B. De Forest, and Thomas S. Gilbert, Birmingham, Conn.

We claim the herein-described corset steel, consisting of two or more wires or steels, united and secured in position by the clasps, in the manner specified, as an article of manufacture.

73,441.—DITCHING AND GRADING MACHINE.—F. H De Tray, Odin, Ill.

I claim, 1st, The ditcher or plow, Bb, in combination with the inclined way or dirt slide, B', as described, and for the purpose set forth.

2d, The conveyer, C, in combination with the ditcher, Bb, and slide, B', as and for the purpose set forth and described.

3d, The stand, c3, wheel, c4, and the out hangers, c2, when combined and arranged in an adjustable manner, so as to regulate the vertical hight of the out end of the pieces, c2, as described, and for the purpose set forth.

73,442.—TREE-FEEDING TUBE.—John C. Fish, Barnstable, Mass.

I claim a tree-feeding tube, having a construction substantially as set forth.

73,443.—LAMP.—Samuel W. Fowler, Brooklyn, N. Y.

I claim the construction of the top of the burner, with its collar or flange, C, circular groove, E, perforations, G, around its lower side, and grooves, D D, on each side, when used in combination with the flange, J, of the chimney, H, as herein described, and for the purposes set forth.

73,444.—RUNNING GEAR FOR VEHICLES.—Daniel D. Gitt, Arendtsville, Pa.

I claim, 1st, Interposing a joint between the spring and the body or axle of a vehicle, either at the front or rear end thereof, said joint being so constructed as will allow of one of the axles to vibrate vertically and independently of the body or bed of the vehicle, substantially as described.

2d, Connecting the coupling bar or reach of a vehicle at one end, by means of a swivel joint, so as to prevent said reach from being twisted or strained by the motions of the axles, substantially as described.

3d, The combination of a joint pin, f, placed between one of the axles and the body of a vehicle, with a reach, which is connected at one end by a swivel joint, substantially as described.

4th, The application of anti-friction rollers, c c, to the sliders, b b', substantially as described.

5th, The sectional head block, E, constructed with a recess in it for receiving a head and neck, which is formed on one end of the reach, substantially as described.

6th, The construction of plates, F and G, substantially as described, so as to form with a pin, f, a loose pivotal connection between the axle and body of a vehicle.

7th, The bearing, h, rising from slider, b, and adapted to serve the purpose described.

73,445.—WASHING MACHINE.—Francis M. Harris, Winnamac, Ind.

I claim, 1st, The combination in a washing machine such as described, with the stationary washboard, of the swinging boards, and spring bands of vulcanized rubber applied to the journals of said swinging boards, in the manner and for the purposes shown and specified.

2d, The combination, with the stationary wash board, swinging board, and springs for inducing the pressure of the latter, of the wash tub, with its peculiarly shaped bottom, arranged with relation to the said washboards, substantially as herein shown and set forth.

73,446.—WELL TUBE.—W. T. Horner, Buffalo, N. Y.

I claim the combination of the outer tube, B, provided with the cross bar, D, with the inner tube, C, provided with the slots, c c, and recesses, d d, at the bottom thereof, constructed and arranged in the manner and for the purposes set forth.

73,447.—RIFLING ORDNANCE.—B. B. Hotchkiss, N. Y. city.

I claim the relieving grooves, C, for the purpose herein set forth.

73,448.—SPRING PEN RACK.—James M. Keep, New York city. Antedated July 22, 1867.

I claim, 1st, A spring pen rack, when the springs are made of rubber, gutta percha, or of any of their compounds, or of sheet metal, the same being of narrow strips or sheets, and of one or more pieces, when bent, curved, and operating substantially as herein described.

2d, The method of attaching the springs of pen racks to their bed pieces, substantially as herein described.

73,449.—CALCULATING MACHINE.—Levi Keiler, Catawissa, Pa. Antedated January 6, 1868.

I claim the two disks, C and D, graduated screw shaft, B, and guide bar, E, when arranged, combined, and operated as herein described and for the purposes set forth.

73,450.—STUFFING BOX FOR VALVE STEMS, &C.—Calvin Kline, Brooklyn, N. Y., assignor to himself and R. L. Peabody, New York City.

I claim the collar, C', on the rotating or partially rotating stem, c, arranged as represented relatively to the casing, A, spring, D, and cap, E, so as to allow of lubrication, all as and for the purposes herein set forth.

73,451.—COATING HEEL AND TOE IRONS FOR BOOTS AND SHOES.—Henry O. Lothrop, (assignor to himself, Crawford Pierce and Joseph R. Pierce,) Milford, Mass.

I claim, as a new article of manufacture, a heel or toe iron, coated with tin or other anti-corrosive metal, substantially as and for the purposes herein shown and set forth.

73,452.—HARVESTER RAKE.—William G. Merrell, Auburn, N. Y., assignor to himself and Cyrenus Wheeler, Jr.

I claim, 1st, in combination with the hollow column supporting the revolving and stationary hubs, the jointed shaft D, that passes up through it, and drives the reel, as and for the purpose described.

2d, Also, in combination with the reel, and a rake that moves and operates in conjunction therewith, a catching mechanism, and a cam ledge that operates substantially as and for the purpose described.

3d, Also, in combination with a reel whose axis of rotation is parallel to the cutting apparatus, adjustable vertically in relation thereto, and is supported by one end only, a rake so arranged as to revolve around the support of the reel, and be thrown into and out of action by a mechanism operating substantially as described.

4th, Also, a support for the rake and reel, so arranged that it may be moved about the driving gear axis, for the purpose of adjusting the rake to the different inclinations of the platform, substantially as described.

73,453.—SAUSAGE STUFFER.—Purches Miles, (assignor to Theodore Mace.) New York City.

I claim the swinging double piston, the one part sliding on the other, in combination with the hopper, contracted as and for the purposes set forth

Also, the elliptical grooves or ribs, l, in combination with the hopper and sliding and swinging piston, as and for the purposes set forth.

73,454.—PISTON ROD PACKING.—William Hartley Miller, Philadelphia, Pa.

I claim the above described packing tube, tubes, layers, or cord, or their equivalent, substantially as shown, as a new article of manufacture.

73,455.—ARGAND LAMP FOR BURNING PETROLEUM.—A. K. Murray and A. B. Howland, Titusville, Pa.

We claim, 1st, the employment of the partition or flange, n, or its equivalent, arranged with relation to the air passages, e and l, substantially as and for the purposes set forth.

2d, The arrangement and combination of the disk, m, perforated casing, k, and partition or flange, n, with the annular wick tubes, substantially as and for the purposes set forth.

3d, The general arrangement and combination of the flange, n, and air passages, e and l, with the annular wick tubes, substantially as and for the purposes set forth.

73,456.—STEAM ENGINE PISTON.—Alexander Nadow, Springfield, Mass.

I claim the valve, g, when used in combination with the piston, B, and ports, k k', substantially as described.

73,457.—HORSE RAKE.—Oziel Nivison, Hector, N. Y.

I claim, 1st, the foot stirrup, S, arranged in connection with the spring, G, so that the operator can thereby aid the spring in unloading the rake, as described.

2d, The hinge plates, P, connecting the staple bar, C, and rake head, B, and provided with a series of holes, in combination with the hinged rods, L, so that the weight of the head thereon aids in unloading the rake, as set forth.

3d, The combination of the spring, G, rod, E, provided with the foot stirrup, S, circular piece, D, hinge plates, P, pressure bar, C, and head, B, arranged and operating substantially as and for the purposes set forth.

73,458.—APPARATUS FOR PREVENTING THE CURCULIO FROM ASCENDING FRUIT TREES.—William H. Noble, Bridgeport, Conn.

I claim the arrangement of a hammer, operating automatically, in such relative position to trees or vines that the blow of the hammer may communicate a jar thereto, substantially as and for the purpose herein set forth.

73,459.—LUBRICATING BEARINGS FOR MACHINERY.—Leverett H. Olmsted, Stamford, Conn.

I claim the lubricator receptacle, C, provided with an opening or openings, said openings being closed with leather, or any other substance that will produce the intended effect, for the purpose set forth.

73,460.—HAY RAKE AND LOADER.—Caleb Plaisted, Kenockee, Mich.

I claim the standards, P P, in connection with rods, C' and S, and with the pulleys, I I and J J.

73,461.—METHOD OF MAKING BARRELS.—Louis Raymond, Rockland, Del.

I claim a keg or cask made of a series of wooden rings, put together with a glued break joint, substantially in the manner and for the purpose set forth.

73,462.—SHOEMAKER'S TRIMMING KNIFE.—John Reist, Philadelphia, Pa

I claim the slotted guard, D, fastened by screw, E, to handle, B, substantially as and for the purpose above described.

73,463.—SEED SOWER.—E. D. Reynolds and O. B. Reynolds, North Bridgewater Mass.

We claim, 1st, A seed sower, having the colter hinged in such manner that it may be elevated, and secured in elevated position, substantially as and for the purpose set forth.

2d, Also, bracing the colter, when made with the above provision, by the brace or latch bar, o, and its locking device or mechanism, substantially as shown and described.

3d, Also, applying the hopper or seed box to the tilting board, substantially as shown and described.

73,464.—BAIT OR MEAT CUTTER.—Nathan Richardson, Gloucester, Mass.

I claim the removable blocks or heads, c c, containing the stationary cutters, and attached to or forming a part of the framing, in combination with the adjustable strips, e, placed between the blocks or heads, c c, and the framing, as and for the purpose described.

73,465.—HEAD BLOCK FOR SAW MILL.—Charles Roberts, Lake Village, N. H.

I claim the combination of the tubular shaft or shafts, K, with the other shaft or shafts, I L, and the lever, M, with its pawls, or their equivalent, constructed and operating substantially as and for the purpose herein specified.

73,466.—MATTRESS.—George Schott, New York city.

I claim a mattress in which the space between the upper and under side of the ticking or case is divided up into boxes or cells by strips of cloth or similar material attached at their edges to such ticking or case, substantially as and for the purposes specified.

73,467.—IRON ROLL.—Samuel J. Seely, New York city, assignor to J. M. Brown, Brooklyn, N. Y. Antedated January 2, 1868

I claim a roll for rolling iron having a solid wrought iron arbor and a sectional cast-iron surface, when constructed substantially in the manner described for the purpose set forth.

73,468.—LADDER.—Abraham Simmerman, Glassboro, and Jacob S. Simmerman, Millville, N. J.

We claim the sections, A B H K, in combination with hooks, g g h h, arms, m i, and legs, e f, all arranged to form a perfect self-bracing ladder, substantially in the manner described.

73,469.—FANNING MILL.—A. W. Smith, Dudleyville, Ala.

I claim the feeding roller, c1, with its projections in combination with the pins, c3, slide board, c4, and hopper, C, when arranged as described.

73,470.—LET-OFF FOR LOOMS.—T. S. Smith, Boston, Mass.

I claim, 1st, The double-arm clutch constructed, arranged and operating substantially as described when the grasp of the clutch is loosened by the pull or tension of the yarn, substantially as set forth.

2d, The lever, D g, in combination with the clutch, when arranged and operating substantially as described.

3d, The combination of lever, clutch, and spring, substantially as and for the purposes described.

4th, The combination of lever, wedge block, clutch, and spring, substantially as and for the purposes described.

5th, The combination of whip roll, wedge block and cross-arm clutch, substantially as and for the purposes described.

73,471.—WAGON BOLSTER.—Charles Stebbins, Owego, N. Y.

I claim the application of two or more rubber springs to the bolsters of a buggy, lumber wagon, cart, or any vehicle drawn or moved by cattle or horses, in the manner and for the purpose above described.

73,472.—STEREOSCOPE.—John W. Storrs, Birmingham, Conn.

I claim, 1st, The rolls, P1 P2, and the connected scroll, Q, tinted substantially in the manner and arranged to operate in combination with stereoscopic views, substantially as and for the purpose herein specified.

2d, Arranging the scroll, Q, to traverse diagonally so as to carry the tinted scroll nearer the picture at the top than at the bottom while the rolls, P1 P2, are equally near the picture, substantially as shown in Fig. 4, for the purpose herein set forth.

3d, The vertical rollers, G1 G2, carrying a series of transparent pictures joined as specified in combination with a stereoscope and arranged to operate the connected scroll, H, substantially in the manner and for the purposes herein set forth.

4th, Mounting the rollers, G1 G2, and connected scroll, H, in frames, 13, adapted to be used in a stereoscope, substantially in the manner and for the purpose herein set forth.

5th, Removing and exchanging the rolls, G1 G2, and the connected scroll, H, without disturbing the gearing, substantially as and for the purpose herein set forth.

73,473.—OILED FABRIC.—George Streat, New York city.

I claim the oiled fabric specified made in the manner set forth, as a new article of manufacture.

73,474.—TONGUE FOR HAY LOADING MACHINES.—Eli Sweet, Whitney's Point, N. Y., assignor, by two deeds, to T. W. Vincent, Eber Sweet and Benjamin J. Jones.

I claim, 1st, The sliding bar, B, in combination with the tongue, A, draft bar, e, and spring catch, C, when arranged to operate substantially as and for the purpose set forth.

2d, The slotted plate, a, guard plate, c', and spring catch, C, combined in relation with each other and with the sliding rod, B, and tongue, A, substantially as and for the purpose specified.

73,475.—ANIMAL TRAP.—N. S. Thompson, Germantown, O.

I claim the combination of the weighted doors, E E', pendant, P, spring catches, g s, pulley and cord, m o, trigger, j, and ledges, c c, arranged in relation to box, A, guides, C D, and the open trigger box, g h, in the manner and for the purpose described.

73,476.—EXPANDING FELLIES AND TIGHTENING SPOKES.—Alban N. Towne, Chicago, Ill.

I claim the combination of the revolving socket having a recess to receive the spoke and a screw chased on its external surface, and the nut with lugs for retaining it in place inserted into the inner face of the felly and having an internal screw to receive the screw in the socket, the parts being arranged to operate substantially as and for the purpose set forth.

73,477.—COAL BOX STOVE.—A. N. Towne, Chicago, Ill.

I claim the arrangement of the stove, C, flanged hearth plate, B, and stationary fuel box, A, said parts being respectively constructed and the whole arranged for use substantially as and for the purpose set forth.

73,478.—CIGAR HOLDER.—W. K. Vanderslice, Jr., San Francisco, Cal.

I claim, 1st, A cigar holder having the pertorated pointed tube, h, entering the center and lying in the longitudinal axis of the cigar and mouth piece together with the supporting ring, c, and wires, d d, substantially as and for the purpose described.

2d, The adjustable point, e, substantially as and for the purpose set forth.

73,479.—CHURN.—D T. Ward, Cardington, Ohio.

I claim, 1st, The adjustable annular ring, F, when composed of the ring, F, made either in one piece or in sections and the wings, G G, with concave surfaces, b b, the whole being used in the manner and for the purpose herein specified.

2d, The use of the dasher, C, constructed as shown in combination with the annular ring, F, in the manner and for the purpose herein specified.

3d, The peculiar arrangement and combination of the uprights, K K, bottom, P, and hoop, Q, for the purpose of holding the churn in position, in the manner herein set forth.

4th, The peculiar arrangement and combination of the churn, A, annular ring, F, dasher, C, pulley, H, belt, I, and driving pulley, N, with crank, O, thereon, the several parts being arranged as and for the purpose herein specified.

73,480.—GANG PLOW.—Seth Way, La Porte, Ind.

I claim, 1st, The mode of supporting the weight by the tongue, I, and of elevating and lowering the plows, D D, by the axle, B, lever, G, windlass, F, and catch, J, respectively, constructed and arranged substantially as set forth.

2d, The combination of the axle, B, lever, G, windlass, F, tongue, I, and equalization double tree, H, respectively, constructed and arranged substantially as set forth.

73,481.—LANTERN.—Hiram Wentworth and V. B. Clark, Ripon, Wis.

We claim, 1st, The spring, F, as applied to lantern bottoms.

2d, The bracket, G, and manner of attaching it opposite to the spring, F.

3d, The arrangement of the spring, F, so as to be operated both above and below the flange, J, at L and K.

4th, The guard, E.

5th, The flange, C, on oilpot, B.

6th, The projection, D, at the top of the oil pot, B.

7th, The arrangement of the different parts, substantially as described and for the purposes specified.

73,482.—DEVICE FOR PULLING HOP POLES.—James R. Woodworth, Nunda, N. Y.

I claim the jaws, B B, fulcrum, F, joint, G, rods, E E, in combination with the handle or lever, A, constructed substantially in the manner herein shown and described.

73,483.—BOOT CRIMP.—Henry Wright, Saco, assignor to James R. Clark, Biddeford, Me.

I claim, 1st, The combination and arrangement of the screw bolt, S, the straining bar, D, the screw, H', and the incline bar, B, all made substantially as and for the purposes set forth.

2d, The combination of the dove-tail, M, substantially as described and for the purpose set forth.

3d, The flexible metallic connection, E', in combination with the lower straining bar, E.

73,484.—CHOCK FOR WHALE BOATS.—Mayhew Adams, Chilmark, Mass.

I claim the construction and use of the chocks consisting of the parts one and two, operating substantially as and for the purpose specified.

73,485.—WINNOWING MILL.—Sanford Adams, Boston, Mass.

I claim, 1st, The fluted rolls, H, for either the hopper, A, or shoe, J, to vibrate upon, substantially as described and for the purpose set forth.

2d, The shaft, L, and spring, O, arranged substantially as described to give an additional motion to the pivoted end of the shoe, J, substantially as and for the purposes set forth.

3d, The slats, e e e, fastened on to the sides, S S, both swinging from the pivots, f, substantially as and for the purpose set forth.

4th, The combination of the hopper, A, slide, I, and screw, t, as and for the purpose set forth.

73,486.—ROASTED COFFEE.—John Arbuckle, Jr., Allegheny City, Pa.

I claim coating roasted coffee with any glutinous or gelatinous matter for the purpose of retaining the aroma of the coffee and also act as a clarifying agent, as herein described and set forth.

73,487.—ELECTRIC CABLE.—Jean Lucien Arman, Bordeaux, France.

I claim an electric cable having a core, A, of fibrous strands, surrounded by insulated wires, B, and fibrous strands, D, and inclosed in an outer covering of strands, E, of buoyant material when the said strands and wires are twisted and arranged in respect to each other, as set forth.

73,488.—LAMP.—Lewis J. Atwood (assignor to himself and Holmes, Booth and Haydens), Waterbury, Conn.

I claim, 1st, The helical expansive interior chimney clamp, m, applied substantially as and for the purposes specified.

2d, The closed cap, b l, in combination with the removable air distributer, e, and tapering wick tube guide, g, as and for the purposes set forth.

3d, Supporting the chimney upon the burner by the joint action of the draft plate, h, and the vertical springs or scallops around the edge of the air distributer, e, substantially as set forth.

4th, The removable air distributer, e, and tapering guide, g, in combination with the draft plate, h, substantially as and for the purposes specified.

73,489.—STEAM ENGINE.—Henry Bailey, New York city, assignor to I. L. Homer, H. F. Pease and W. R. Pease.

I claim the combination with the cylinder, B, and head, D, for inclosed operation within them of the piston, pitman and crank as described of the interposed slide, H, with its rocking joint piece or block, I, all for action together, essentially as herein set forth.

73,490.—TWEER IRON.—Lyman M. Bailey (assignor to himself and Joseph P. Long), Landgrove, Vt.

I claim the combination of the chamber, A, perforated cap plate, C, solid valve, D, and sliding door, F, all constructed as set forth.

73,491.—BOLT LATCH.—Henry Baker (assignor to himself and Christian G. Herr), Lancaster, Pa.

I claim the arrangement and combination of a shutter bolt with its open slot, h, and recess for the pin, c, with its handle, I, and horizontal and vertical bevelled latch and lock catch, G G', with or without the lock lever, K, all arranged and operated in the manner and for the purpose specified.

2d, Also, in combination with the foregoing arrangement, the latch lever, M, with its neck, m, and rocker, L, when applied in the manner and for the purpose shown and set forth.

73,492.—MODE OF HANGING CARRIAGE BODIES.—George A. Blair and A. L. Gladding, Johnsonburg, N. Y.

We claim suspending the circular lever frames, G G', on the two pulley bearings, n n, arranged with relation to the seat, B, and body, A, of the carriage by means of the elastic strap, I, substantially as and for the purposes set forth.

73,493.—WOOD-BENDING MACHINE.—I. W. Bowers, Boston, Mass.

I claim the portions, D D, pivoted together in combination with the former, C, operating substantially as set forth.

73,494.—BREECH-LOADING FIRE-ARM.—Frances E Boyd and P. Shelton Tyler, Boston, Mass.

We claim, 1st, The plate or washer, e, formed as described and attached to the spindle, c, in combination with the raised or cam-shaped surface of the bearing plate, d, as set forth.

2d, Also the combination of the clamps, g g, and the curved and cam projections of the face plate with the bearing plate, d, and plate or disk, q, constructed and operating substantially as and for the purpose set forth.

73,495.—LAMP.—Ovette Boynton, Hinesburg, Vt.

I claim the burner, constructed and arranged substantially as set forth and described, that is to say, with its water chamber interposed between the flame and lamp provided with oil and water-feeding ducts and a well tube, through which the wick descends to the oil.

73,496.—WOOD-BENDING MACHINE.—D. F. Breed, Valparaiso, Ind.

I claim, 1st, The slotted plate, P, in combination with the rod, m, and drum, D, operating substantially as and for the purpose set forth.

2d, The adjustable guides, 4, rods, W, levers, Z, bed plate, 2, bands, H and I, arranged to guide the stuff to be bent and to prevent a lateral motion, constructed and operating substantially as and for the purposes described.

73,497.—SPRING ATTACHMENT FOR VEHICLES.—Eliphalet C. Brooks, San Francisco, Cal.

I claim the combination of the shield, A, bolts, F and G, with the perch, D, axle, E, in combination with the spring, C, and thorough brace, B, substantially as shown for the purposes specified.

73,498.—COMBINED KNOB LATCH AND LOCK.—Conrad Brown, Goshen, N. Y.

I claim, 1st, The upright pieces, D D1, provided with vertical slots, h h1 h2, and slanting cross slots, i i1 i2, substantially as and for the purposes specified.

2d, The combination of the catch, d e, with the notches, c c1 c2, in the door bolt, C, substantially as and for the purposes described.

3d, The combination of the falling tumblers, E E1 E2, uprights, D, D1, and key, J, with the catch, d e, and door bolt, C, provided with notches, c c1 c2, for the purpose of changing the locking device, substantially as described.

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73,499.—CHAIR SEAT SUPPORTER.—George Butterfield and A. G. Treadwell, Boston, Mass Antedated January 11, 1868.

We claim the slats, b b, to be used substantially as herein described and for the purpose specified.

73,500.—HOP PRESS POWER.—Newel Carpenter, White Creek, Wis.

I claim the lever, D, provided with the lugs, e, in combination with the bar, E, having the grooves, b, in its sides and the notches, g, on its edges with the pawls, k, all arranged for joint operation substantially as described.

73,501.—HARVESTER.—William D. Carpenter (assignor to himself and J. Stackpole), South Berwick, Me.

I claim, 1st, The reciprocating slide intermediate between the driving gear and the reciprocating sickle bar arranged to operate in reverse direction to said sickle bar, for the purpose and substantially as described.

2d, The tubular pinion and crank wheel, H H', mounted on a stationary stud orpin on standard, g, in combination with its driving gear, arranged and operated as described.

3d, The bevel wheel, D, bevel pinion, E, shaft, F, spur wheel, G, crank and pinion wheel, H H', pitmen, i i, k, slide, J, and lever, K, all arranged and operated as described and for the purpose set forth.

73,502.—FORGE HEARTH.—Robert W. Clark, Pittsburg, Pa.

I claim the use of a single fire-clay brick or tile in blacksmiths' forges, substantially as described, as a new article of manufacture.

73,503.—CHURN.—George Clayton and Collis B. Allen, Willoughby, Ohio.

We claim the special construction of the triangular frame, A, standard, D, as arranged in combination with the churn, H, when operated in the manner as and for the purpose set forth.

73,504.—PLOW.—Wm. S. Colwell, Pittsburg, Pa.

I claim a plow provided with a mold board having the surface convex, in the manner and for the purpose herein described and set forth.

73,505.—STAVE MACHINE.—Wm. S. Colwell, Pittsburg, assignor to James M, Hempbill, Allegheny City, Pa.

I claim the hollow wedge, constructed as herein described, and used in connection with the knives, C and D, and set screws, f and e, in the manner and for the puspose herein set forth.

73,506.—HYDROCARBON BURNER.—Frederic Cook, N. Y. city.

I claim, 1st, The introduction and distribution, by centrifugal force, of liquid hydrocarbons into furnaces as fuel, substantially as shown and described.

2d, The introduction and distribution of water, in combination with liquid hydrocarbons, into furnaces by centrifugal force, substantially as shown and described.

3d, Also the revolving distributer, D, with its head, F, constructed, arranged, and operating as and for the purpose set forth.

73,507.—MACHINE FOR MAKING AND DIPPING MATCHES.—James F. Cranston (assignor to himself and S. W. Porter), Springfield, Mass.

I claim, 1s, The arrangement of the cutters, C and B, belts, F and G, and dipping pans, X and Y, having the melting cups, P and P, operated in connection with each other by the horizontal shaft, O, substantially as and for the purpose described.

2d, The device for the purpose of transferring the match stems from the cutters, C and B, to the belts, F and G, consisting of the springs, t and t', and guides, s and s', constructed and arranged as described.

73,508.—CURD BREAKER.—Palmyra Crary, Lowville, N. Y.

I claim the implement so constructed and described as herein set forth.

73,509.—CAR BRAKE.—Wm. G. Creamer, Brooklyn, N. Y.

I claim, 1st, The jointed pawl, D, in combination with the arm on the brake shaft, I, and the ratchet on the drum, K, substantially as described and for the purposes set forth.

2d, In combination with the drum and jointed pawl, as above claimed, the ratchet wheel, A, and pawl, B, the wheel being fixed on the drum, as described and for the purposes set forth.

73,510.—CAR SEAT.—Wm. G. Creamer, Brooklyn, N. Y.

I claim the combination with, and attachment to, the seats or chairs of railroad cars, of an arm rest and protector, substantially as described and for the purposes mentioned.

73,511.—JEWELING WATCHES.—A. C. Crosby, Piqua, Ohio.

I claim the adjustable tapering spindle, B, the spring arm, D, with or without the curves, a, in combination with the hub or sleeve, A, for the purpose and in the manner set forth.

73,512.—MANUFACTURE OF CARPETS AND OTHER ARTICLES FROM JUTE, FLAX, ETC.—Thomas Crossley, Bridgeport, Conn. Antedated July 22, 1867.

I claim treating fabrics composed wholly or partly of jute, flax, cotton, or other suitable vegetable fiber, substantially in the manner herein set forth, so as to prepare the same for dyeing or printing, and the manufacture of carpets or other articles for which such fabrics may be applicable.

Also, the manufacture produced thereby.

73,513.—APPARATUS FOR DISCOVERING THE FISSURES IN THE SIDES OF WELLS.—John D. Dale, Rochester. N. Y.

I claim, 1st, The combination with the head, of and adjusting gage, E, for adapting the device to the diameter of the bore, as specified.

2d, The combination with the head of an indicator F, as described, and for the purpose set forth.

73,514.—PROCESS FOR MULTIPLYING COPIES FROM MANUSCRIPT.—Abel Claude Felix Niepce de St. Victor, Paris, France, assignor to P. A. G. Niepce de St. Victor and M. L. J. Lavater.

I claim, 1st, The process of taking copies from manuscripts by submitting the copies, on issuing from the copying press, to the action of ammonia, substantially as herein described.

2d, The treatment of manuscript copies with either alkaline or acid vapors to develop the writing, according to the constituents of the ink, substantially as herein described.

3d, The impregnating of the copying paper with sugar or other adhesive matter, substantially as and for the purpose herein set forth.

73,515.—HORSE HAY FORK.—H. E. Dewey, Aurora, Ill.

I claim in combination with a screw fork, A, operating substantially as described, the spool, D E F, and sheaves, C C, arranged with the cord, R, substantially as and for the purposes specified.

73,516.—CROSS-CUT SAW.—Thomas S. Disston (assignor to Henry Disston), Philadelphia, Pa.

I claim a bolt, D, with a slotted head, f, in combination with a handle, B, slotted for the reception of one end of a saw blade, and having screws, b, or other equivalent bearings, for the end of the said blade, when the latter has openings, d e, adapted for the reception of the head and end of the bolt, all substantially as described.

73,517.—RACK FOR TOWEL.—Elisha E. Everitt (assignor to himself and H. F. Hover), Philadelphia, Pa.

I claim a rack or holder to the side pieces of which are secured coils, a, of wire, adapted for the reception of the ends of rods extending between the side pieces, all substantially as described,

73,518.—CHAIN MACHINE.—Luke Fitzpatrick and Jacob Schinneller, Temperanceville, Pa.

We claim, 1st, The combination of the nut, B, with the mandrel, A, constructed, arranged, and operating substantially as herein described and for the purpose set forth.

2d, Also the spring set, D, and guide, e, when used in combination with the cutter, C, constructed, arranged and operating substantially as herein described and for the purpose set forth.

73,519.—MACHINE FOR COLLECTING AND CONDENSING METALLIC VAPOR.—Ferdinand Formhals, San Francisco, Cal.

I claim, 1st, The construction of the cagniardelle blower principally of wood.

2d, Also the combination of the cagniardelle with the furnace, in combiation with tanks, substantially as set forth and shown and for the purposes specified.

73,520.—SAWING MACHINE.—John Fry, Brookfield, Ill.

I claim providing the frame of a portable sawing machine with an arm or prolongation, so constructed and arranged that a sawhorse can readily be attached to or detached from the same, as and for the purposes specified.

73,521.—MANUFACTURE OF ILLUMINATING GAS.—Robert M. Fryer and Andrew R. Fryer (assignors to National Gas Light Co.), New York city.

We claim, 1st, The process above described for manufacturing illuminating gas, which consists in distilling the coal at a low heat, and converting the distillate and condensable products into gas, in separate benches or retorts, substantially as described.

2d, The process of converting the volatile products or fluids, given off from the first bench of retorts, into gas, by subjecting the distilled products to the different temperatures required to convert the same into gas, substantially as set forth in the foregoing specification.

3d, The construction and use of the automatic seal valves, which are employed for the same purpose, and instead of the ordinary hydraulic main of gas works, substantially as above set forth.

4th, The manner of distributing the distilled products or fluids given off from the first bench of retorts, equally to the several gas producing retorts, by means of the several traps and connections, substantially as above set forth.

5th, The manner of separating the gas generated in the second bench of retorts from such fluids as escape conversion into gas in these retorts, and the method of passing the gas thus generated into pipes leading to the gas holder, while the fluids are conveyed directly into the third bench of retorts, where they are subjected to a higher heat, necessary to convert the same into gas.

6th, The combination of the whole gas generating apparatus, as described in the foregoing specification, and for the purpose therein named; and this we claim whether the constructed apparatus be precisely in the form described by us, or otherwise, if it produces substantially the same results.

73,522.—BRICK MACHINE.—R. M. Gano, Allegheny City, Pa.

Antedated Jan. 17, 1868.

I claim the pressure roller, C, arranged to operate in combination with the rotating table, provided with a series of molds for forming bricks, substantially as described.

73,523.—CIDER MILL.—Lewis Gebhart, Orangeville, Ohio.

I claim the cider mill consisting of the toothed cylinder, B, strainer, F, endless aprons, O Q, pan, G, spring, L, adjustable roller, H, and roller, I all constructed and arranged to operate in the manner as and for the purpose set forth.

73,524.—DRESSING MILLSTONES.—Sam'l Golay, L'Asse-Mill, near Noyon, Switzerland.

I claim, 1st, A cutting tool armed with a diamond or diamonds, or other hard stones, and so constructed and operating that while it is caused to traverse, it will cut or chip a furrow or groove in a millstone by a succession of blows, as set forth.

2d, The disks, l and l', hung to a spindle, J, and having sockets, p, of different sizes, in which the cutting stones are held when the disks are brought together, as described.

3d, The cutting tool, k, constructed substantially as specified, in combination with the mechanism herein described, or any equivalent to the same, for imparting to the said tool a rotary, longitudinal, or lateral motion, as and for the purpose herein set forth.

4th, The adjustable frame, A, guided by the central spindle, P, and carrying the adjustable plates, c', in combination with the pivoted frame, B,

5th, The reversible guide bar, C, so secured to the frame, B, by bolts, f, that it may be inclined, for the purpose specified.

73,525.—HOE AND GARDEN RAKE COMBINED.—R. H. Gordon, Sr., Brooklyn, Ohio.

I claim a combined hoe and rake constructed with flukes, B, enlarged or widened at the point, a', and provided with the shanks, E, in the manner as and for the purpose specified.

73,526.—STEEL TRAP.—C. P. Goss and Adrian Rais, Waterbury, Conn.

We claim constructing a steel trap with a compound spring or springs and base plate of one piece of sheet steel, substantially as herein described.

73,527.—RAT TRAP.—John C. Guerrant and Benton J. Field, Leaksville, N. C.

We claim, 1st, The combination of the spring, D2, lever, E, connections, f g A', and movable platform, B, with the movable wing, B', connections, b d i, and stop pin, i', all arranged and operating substantially as and for the purpose herein specified.

2d, The combination with the above of the rod, H, stop, h, and spring, h', arranged and operating in the manner and for the purpose set forth.

73,528.—PIPE AND ROD CUTTER.—D. Frank Hartford (assignor to himself and Edmund Tarbell), Boston, Mass.

I claim, 1st, The cutter holder, C, combined with the feed screw, P, and the adjusting screw, O, made substantially as described and for the purpose set forth.

2d, The cutter holder, C, and knife, D, combined with the supporting bolster, E, made substantially as described and for the purpose set forth.

73,529.—RAILROAD RAIL FASTENING.—Nicholas Heading, Cincinnati, Ohio.

I claim, 1st, In the described combination with a sole-plate and keying-device beneath the rail ends, the yoke, D, occupying the notches, C C, in the rail ends, substantially as and for the purpose set forth.

2d, The sole-plate, H, constructed with the upturned corners or lugs, i i' i" and i"', for the purpose above explained.

73,530.—BUGGY TAP.—Wm. S. Johnson, Henderson, Ky.

I claim a buggy tap, E, whose screw threaded orifice, e, is prolonged to its outer end, and provided with a temporary screw, F, adapted to operate as set forth..

73,531.—ROOFING COMPOUND.—John A. Jones (assignor to himself and A. F. Mears), Baltimore, Md.

I claim the within named ingredients, used together, substantially in the proportions and for the purpose set forth.

73,532.—COMBINED RULE AND SQUARE.—W. O. Jones, Portland, Me.

I claim making the joint in the manner described, so that the rule can be used as a square, and this in combination with the graduated scale, so that it can be used as a bevel.

73,533.—MANUFACTURE OF HINGE HOOKS.—Charles Kaulbeck (assignor to himself and Watson W. Roberts). Boston, Mass.

I claim the mode, substantially as described, of manufacturing shutter or blind hinge hooks.

73,534.—GAS COCK.—Peter Keller, New York city.

I claim, 1st, A gas cock, which when opened forms a space, d, and an annular channel, e, substantially as and for the purpose described.

2d, The arrangement and combination of the pipe, B, with a perforated tip, adjustable shell, C, and bulb, A, substantially as and for the purpose set forth.

73,535.—BOTTOM FOR COAL HOD.—E. W. Kimball, Hudson, N. Y.

I claim a cast iron bottom for coal scuttles, or hods, when the same is cast with a lower rim or base, C, having a hand recess, E, and is also provided with suitable means of attachment to the body of the scuttle or hod, substantially as described.

73,536.—CIRCULAR-SAW MILL.—J. L. Knowlton, Philadelphia, Pa.

I claim, 1st. The combination and arrangement of the carriage, M, and yokes, N and R, or their equivalents, the latter bearing the circular saw, S, when the parts are so constructed and arranged that the yoke, R, rests upon the yoke, N, and the latter is pivoted to the carriage, so that the saw can be moved to and from the log, or inclined in any direction, the carriage being at liberty to move back and forth as the inclination of the saw may require, and without the aid of any mechanical arrangements, substantially in the manner and for the purpose specified.

2d, The combination of the wedge roller, P, with the yoke, R, and constructed with lateral movement in such a manner as to allow angular movement of the saw mandrel without disturbing its relative position with the log.

73,537.—WATER METER.—Wm. Livingston, New York city.

I claim, 1st, The construction of a water or fluid meter, consisting of a measuring vessel or cylinder, enclosed in an outer casing or jacket, the intervening space or spaces forming the water ways to and from the measuring cylinder.

2d, The combination of a piston with jointed plates or bars, or other proper flexible material, that will extend and close up with the motions of the piston, and give positive action to the valves at either end of the stroke.

3d, The combination of a piston and intermediate flexible attachments with the valves, either slide valves or other valves, by means of the rod, F, and its inclined plane, S, working the valve rod, E, or by means of a bell crank or other lever, taking motion from the piston at certain points of the stroke, and transferring the same to the valves, substantially as described.

73,538.—LAMP.—E. A. Locke and Wm. N. Weeden, Boston, Mass.

We claim a sectional lamp cone, made to open and close, as and for the purpose substantially as set forth.

Also, a removable chimney supporting ring or base, holding the parts of the cone together, substantially as described.

73,539.—APPARATUS FOR DISTILLING SPIRITUOUS LIQUORS.—Orazio Lugo (assignor to John F. Collins), New York city.

I claim, 1st, Introducing into a distilling apparatus a current of alkalinetted air, substantially in the manner described and set forth.

2d. One or more receivers or analyzers between the still and condenser, having enclosed rotating and stationary fans, for the purpose described and set forth.

3d, Producing, in connection with or continuation of the process of distilling alcohol, ethers during the same operation, substantially as described and set forth.

73,540.—PROCESS FOR PRODUCING OXYGEN AND CHLORINE.—Jules Theodore Anatole Mallet (assignor to Jean Marie Onesime Tamin), Paris, France.

I claim the process for producing, conjointly or separately, oxygen and chlorine gas, substantially as herein described.

73,541.—MACHINE FOR BLOCKING AND STRETCHING HATS.—Geo. A. Mandeville and Wm. E. Pine, Newark, N. J.

We claim, 1st, A forming block, combined with a system of radially adjustable, brim-supporting arms, constructed and operating substantially as described.

2d, A circular series of radially-sliding, brim-supporting arms, to enter the body of the hat, and adjustable in fixed positions to and from a center, substantially as shown and described.

3d, The adjustable ring, 4, sliding in the inclined slots, to vary the positions of and hold securely the radial, brim-supporting arms in the desired fixed position, either to or from a center.

4th, The combination with a radially mortised plate of a circular system of radial, brim supporting arms, arranged to receive the hat block within the circle they describe.

5th, The radial arms of the system of brim supporting arms, constructed with their outer surfaces tapering gradually downward from the top of the sectional band plate, as and for the purpose described.

6th, The combination of the ring, 4, its supporting frame, and an adjustable lever, for operating it and holding the brim supporting arms positively and firmly in the position to which they may be adjusted.

7th, The combination of a perforated hat-forming block with a grooved, perforated, or skeleton supporting plate, for the purpose set forth.

8th, The arrangement of a series of clamping fingers with the series of stretching arms, and with their supporting frame, whereby is provided the means for the adjustment of the clamping fingers, independent of the means for the adjustment of the stretching arms, substantially as described.

9th, The combination of grooved cam plate, F, whether with or without its rim or handle, with its system of radial stretching arms, substantially as and for the purpose set forth.

10th, The arrangement, in a hat blocking machine, of lever 18 with the adjustable stop 22, to limit the upward movement of the hat block, for the purpose set forth.

11th, The combination of a set of radial stretching arms with a set of slides, the inner surfaces of such slides forming the banding rim, substantially as described.

12th, The combination of the loose, adjustable ring, J, with the outer system of stretching arms, for the purpose of graduating the amount of stretch to be given to the brim of the hat body, substantially as described.

13th, The loops or guards upon the radial stretching arms, to sustain the ring, J, and serving therewith to form slots, or guides, to insure the positive expansion of the system of stretching arms by the action of the ring, when raised.

14th, The combination, with the stretcher carrying sliding frame, of the counterbalancing weights, substantially as shown and described.

15th, The combination of an outer system of rising and falling stretching arms, with an inner system of radially sliding, brim supporting arms, which have no rising or falling motion.

16th, The combination in the same machine, and for joint action, of a system of radially adjusting, brim supporting arms, a system of stretching arms and a rising, hat forming block, the same operating substantially as described.

73,542.—HAY AND COTTON PRESS.—Louisa J. Maxey, Troy, Ind., administratrix of the estate of Edward G. Maxey, deceased, and Wm. R. Mason, Lewisport, Ky.

We claim, 1st, The combination of the gearing wheels, c d e f g g', with the double reciprocating rack and compressing beam, F, constructed and arranged substantially as and for the purposes herein described.

2d, The pitmen, i i', in combination with the outer head blocks, b b', and the doors, k' k', and their self-acting apparatus for chocking the head blocks, and releasing them when the doors are opened to take the bale out, constructed and arranged substantially as and for the purposes herein described,

3d, The relieving slides, p p', in combination with the packing compartments, C C, arranged substantially as and for the purpose herein described.

73,543.—MEANS FOR STUFFING CHAIRS.—Wm. E. Michael (assignor to himself and Abram Setley), New Holland, Pa.

I claim the combination, with the slats, E, of cross strips, D and B, screws, C, and rounded cover, when constructed and applied substantially in the manner shown, for the purpose specified.

73,544.—HAY ELEVATOR.—Abil Mott (assignor to himself and Warren Kenyon), Scott, N. Y.

I claim the frames, A and H, with their cords and pulleys, the frame, F, and pin, G, constructed and used substantially as and for the purpose set forth.

73,545.—TREATING CAOUTCHOUC AND OTHER GUMS.—J. B. Newbrough and E. Fagan, New York city.

We claim the within described new manufacture of substance, consisting of caoutchouc, or equivalent gum, incorporated with iodine, and bromine (after treating the said iodine and bromine with turpentine, or equivalent oil, as described), and subjected to heat.

73,546.—INSTEP STRETCHER.—C. C. Pease, Jamestown, as signor to himself, Giles Milks, and S. B. Brinnstool, Kennedy, N. Y.

I claim, 1st, The slide, slot and screw, 2, as herein described, for raising and lowering the instep block of a last, as and for the purpose specified.

2d, Connecting the slide, slot and screw to a last, when arranged so as to be used and operated for the purpose described.

73,547.—COMBINED CULTIVATOR AND HARROW.—Chas. Rich and Oscar L. Neisler, Poughkeepsie, N. Y.

We claim, 1st, The adjustable bars, K' K', when arranged on the sides of the hill, and when provided with handles, j j, connected at their upper ends so that the teeth can be accommodated to irregularities in the hill, or can be connected for broadcast harrowing or tilling, substantially as herein shown and described.

2d, The device for connecting the harrow frame, C, with the axle, A, and driver's seat, i, consisting of the bars, E and F, on the axle, of the links, G, levers, H and J, and connecting rods, h and i, all made and operating substantially as and for the purpose herein shown and described.

3d, The above, in combination with the notched bar, M, when made as and for the purpose described.

4th, Securing the draught bars, N, to the rear of the harrow holders, K, substantially as and for the purpose herein shown and described.

5th, The hollow cultivator tooth, P, when arranged so that it can be fitted to and easily removed from a harrow tooth, L, substantially as and for the purpose herein shown and described.

73,548.—SEED SOWER.—A. Rowe, W. H. Mitchell and E. B. Hamill, Macomb, Ill.

We claim, 1st, The fluted or ribbed concave disk, D, made of a single plate struck up with the ribs, k, in the form and manner substantially as shown and described.

2d, The oblong curved opening, l, for the passage of the grain from the hopper to the disk, as set forth.

3d, In combination with the opening, l, the oscillating slide valve, f, for regulating the delivery of the grain at different points of the disk, as described.

4th, The rotating arm, p, mounted on the shaft, F, and arranged to revolve within the hopper, E, as shown and described.

73,549.—CARTRIDGE BOX.—P. F. Schneider, Hartford, Coun., assignor to himself, W. H. D. Callender, and B. C. English.

I claim, 1st, The spring lever, G, provided with spring lug, a, operating the ratchet, D, of the cartridge chamber in its forward motion, and returning to its original position, sliding over the ratchet in the manner described, substantially as specified.

2d, The plate or lid, J, provided with slot, I, through which play the handle, H, of the spring lever, G, having spring lug, a, operating the ratchet wheel of the cartridge chamber, allowing the ejection of but one cartridge at a time, and admitting the operation of said ratchet wheel continually from the same point, and the lever to return to its proper position, ready for its next operation, substantially in the manner represented and described.

73,550.—PLOW.—Geo. K. Smith and Joseph Strasser, Allegheny City, Pa.

We claim, 1st, The combination of the graduate, C, with the beam, D, constructed, arranged and operating as herein described, and for the purpose set forth.

2d, The combination of the movable cap, B, with the beam, D, and graduate, C, constructed, arranged and operating as herein described and for the purpose set forth.

73,551.—RAILWAY SWITCH.—Joseph B. Spurgin and Thomas A. Kirk, Kansas City, Mo.

We claim, 1st, The combination and arrangement of the two main tracks, A and B, one or more oblique or inclined tracks, D, and one or more switch tracks, C, with each other, substantially in the manner shown and described, and for the purpose set forth.

2d, The pieces, G and H, one or both constructed substantially as described, in combination with the rails of two tracks, at the point where the said tracks meet and unite to form one track, substantially as herein shown and described, and for the purpose set forth.

73,552.—MEDICAL COMPOUND.—James T. Stewart, Peoria, Ill., assignor to Samuel R. Whitlow, Rochester, Ill.

I claim an improved medical compound, prepared of the ingredients and in the proportions and manner substantially as herein set forth and described.

73,553.—COMPOSITION FOR FUEL.—Washington Stickney and Nathan B. Chase, Lockport, N. Y.

We claim the improved composition for fuel, prepared of the material and substantially in the manner herein set forth.

73,554.—BOOT CRIMP.—John Tipton and J. Carl, Malaga, Ohio, assignors to John Tipton.

We claim, 1st, The combination of the plates, A A, with the two right and left screws, r r', and the spur wheels, g g, substantially as and for the purpose specified.

2d, The combination and arrangement of the plates, A A, with the arms, e e, braces, e' e', joints, l, and arms, C C, substantially as and for the purpose specified.

3d, The bar, M, when constructed with slotted ends, a ratchet surface on its upper side, and a central female screw, substantially as and for the purposes set forth.

4th, The combination of the plates, A A, with the arms, C C, bar, M, screw rod, R, and board, B, substantially as and for the purposes specified.

5th, The combination of the plate, O, board, B, jaws, o o o, and screw rod, R, when the parts are constructed and applied together, substantially in the manner and for the purposes specified.

73,555.—TAMPING AND BLASTING MACHINE FOR SPLITTING WOOD.—Elisha W. Walton, Drytown, assignor to Joseph H. Atkinson, San Francisco, Cal.

I claim, 1st, the construction of the barrel with a charge cavity and screw, with cross head, handles, nipple and hammer, substantially as described, and for the purposes set forth.

5d, The screw cleaner, for the purposes set forth.

73,556.—CHURN.—Samuel J. Whipple (assignor to himself and Joseph H. Atkinson), Orville, Cal.

I claim a metallic or wooden churn, in which all the parts described and represented are arranged in the manner set forth.

73,557.—HAND HOLE JOINTS FOR BOILERS.—Gilbert White, Harlem, N. Y., assignor to himself and Gustavus Pierrez, New York city.

I claim the packing, C, of the face, a, and the cover, A, in combination with the plate, D, all constructed and arranged substantially as shown and described.

73,558.—STONE AND STUMP EXTRACTOR.—Moses Wieand and George Gorr, Emaus, Pa.

We claim the portable power, consisting of the mechanism arranged substantially as described, and provided with the chain, f, having the stationary hook, p, and the sliding hook, p', all mounted on the frame, constructed as set forth.

73,559.—SPRING HOLDER.—Daniel Witt, Hubbardston, Mass assignor to Dexter Howe, New York city.

I claim the spring, A, in combination with the screw bolts, C, sockets, B and nuts, b b, substantially as described, for the purpose specified.

73,560.—DITCHING MACHINE.—E. Worth and C. A. Davis, Oswego, Ill.

We claim, 1st, The knives, L, arranged to operate substantially as and to the purpose set forth.

2d, The point, F, jointed to the shoe, E, in combination with the cutter bar K, screw, J, and standards, I I, arranged to regulate the depth of the machine in the ground, substantially as set forth.

3d, The combination of the horizontal shears, D, inclined flanges, C, with cutter bars, K' K', knives, L, and mold board, B, substantially as set forth.

73,561.—WRENCH.—Hugh S. Wrightson (assignor to M. M. Welby and C. H. Slicer), Baltimore, Md.

I claim, 1st, a wrench, with its adjustable jaw constructed and applied to its handle and stationary jaw, as described, when its ratchets or teeth are located as and operated in combination with groove, b, and tongue, d, in the manner and for the purpose specified.

Also, button, E, in combination with groove, b, and tongue, d, for holding the removable jaw to its seat, as herein described.

73,562.—SASH FASTENING.—C. M. Amsden, Wooster, Ohio.

I claim the spring bolt, b, in the side of the sash, B, provided with the shaft e, working in the slot, f, of the sash, and operated by means of the slotted lever, C or H, pivoted to the sash, B, constructed and arranged as described for the purpose specified.

73,563.—FASTENER FOR STAIR RODS.—Wm. R. Anderson, New York city. Antedated Jan. 8, 1868.

I claim the combination of the stationary framework, A, movable arm, B and hook, h, substantially in the manner and for the purpose set forth.

73,564.—PLOW GAGE WHEEL.—Philo D. Beckwith, Dowagiac, Mich.

I claim, 1st, The axle or skein, B, cast upon the wheel, A, as and for the purpose set forth.

2d, The shank, C, with a hub cast upon its lower end, and used in combination with the wheel, A, and its axle, B, substantially as herein set forth.

73,565.—PROCESS FOR SEASONING AND PRESERVING WOOD.—Sigismund Beer, New York city.

I claim seasoning, preserving, and purifying wood, by extracting its perishable matters, without injuring the wood substance, and associating there with a durable and antiseptic substance, which makes it harder, water-proof indifferent to atmosphereic changes, and less combustible, by the process above described, in which borax, or some other borate or boracic acid, or a like compound, is employed, substantially as and for the purpose specified.

73,566.—COFFER DAM.—Edwin Bell, St. Paul, Minn.

I claim, 1st, In combination with a floating coffer dam, constructed substantially as described, the flexible bag, sack, or pipe, F, for packing the same, and excluding the water.

2d, Also, the use of the apron, of rubber cloth, canvas or other flexible material, made water-proof, for packing the joints between the tiers of planks forming the inner walls of the dam, substantially as described.

73,567.—CONSTRUCTION OF HANDLES FOR METAL TEA AND COFFEEPOTS.—Wm. Bellamy, Newark, N. J.

I claim a tubular metal handle, filled with plaster-of-paris, for metal tea and coffeepots, substantially as and for the purpose set forth.

73,568.—CULINARY VESSEL.—W. H. Bennett, New York city.

I claim the combination of the vessel, D, divided into various compartments by the vertical partitions, c, each compartment having its own tap, the perforated receptacle B, leaving the space between its sides and the outer casing, C, open, and widest at the bottom, and the hot-water vessel, A, all arranged as described for the purpose specified.

73,569.—VIOLIN.—Bainbridge Bishop, New Russia, N. Y.

I claim, 1st, The supplementary bridge, J, to the extended finger board, D substantially as and for the purpose specified.

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73,570.—MODE OF CUTTING CHANNELS IN BOOTS AND SHOES. L. R. Blake, Boston, Mass.

I claim the combination of leading and following knives, for the purpose of forming different sized grooves in channels, when the leading knife is constructed with such a breadth of back as will cover the cutting edge of the following knife, substantially as described.

Also, the formation of the channel, substantially as shown and described.

73,571.—MANUFACTURE OF LOCKING RINGS FOR CLOSING FRUIT JARS.—L. R. Boyd, New York city.

I claim the above described improved method of manufacturing screw rings for fruit jars and other analogous articles, substantially as and for the purposes set forth.

73,572.—PAPER FILE.—Solomon Brock, Brooklyn, N. Y.

I claim, 1st, The employment of threaded needles, arranged stationary in the file, and operating with a paper flap, for the purpose of passing a thread in the letters or papers, with the operation of filling the same in the file, so that the letters or papers may thereby be secured when removed from the file, substantially as herein shown and described.

2d, The combination and arrangement of the file case or frame, A, with the side, B, and needles, E E, the flap, D, and springs, F F, and notches, H H, operating together substantially as and for the purpose herein shown.

73,573.—MACHINE FOR SUPPORTING TIN CANS WHEN BEING SOLDERED.—Almond Brooks, Columbus, Ind.

I claim the combination of the adjustable frame pieces, A, with inclined faces and grooves, A', the spider, B, tubular shaft, C, internal rod, D, plate, E, elastic bands, F, and pawl, G, constructed and arranged to operate substantially in the manner and for the purpose set forth.

73,574.—TWEER IRON.—Jairus Brown, Portland, Mich.

I claim the construction and arrangement of the cylinder, A, the head or cap, B, provided with more or less openings, C D E F and G, the rod, H, the false cap, I provided with appropriate openings, J, the crank, K, the lever, L, the cylinder, M, the false bottom, N, and the door, O, when constructed and operating substantially as and for the purposes set forth.

73,575.—AXLETREE.—Chas. E. Buck, Racine, Wis.

I claim the rod, C, applied to the straight axle, A, its ends passing through the under sides of the thimble skeins, B, securing them in place, and its center held in position by means of the brackets, a, the rod, C, being tightened by means of the nuts, D, as herein shown and described.

73,576.—CONCRETE BRICK PRESS.—T. J. Burke, Chicago, Ill.

I claim the cam wheel, R, in combination with lever, J, follower, D, slides, X X, lever, N S, and box, B B, arranged to operate in the manner as herein set forth.

73,577.—SAND PUMP FOR OIL WELLS.—John F. Carll, Brooklyn, N.Y.

I claim, 1st, A sand pump provided with valves, D J, and their connecting agencies, arranged in such manner that the valves will be operated automatically, and the pump filled with sand or debris under the static pressure of the water within the well or hole, substantially as herein shown and described.

2d, The valve stem, G, with the tube, H, yoke, I, oblique slot, e, pin, g, and the slots, f f, all arranged to operate in connection with the valve, J, substantially as and for the purpose specified.

3d, The safety valve, F, arranged in relation to the valves, D J, applied to the cylinder of a sand pump to operate in the manner substantially as and for the purpose set forth.

73,578.—STEAM GOVERNOR.—William L. Collamore, Warren, R. I.

I claim the combination of the supplemental weights, H, and lever, B, with a governor, substantially as herein specified.

73,579.—RECTIFIER AND CONDENSER FOR ALCOHOLIC SPIRITS.—J. F. Collins, New York city.

I claim the construction and use of a rectifier for alcoholic or other spirituous vapors, in the manner and form substantially as described and set forth, and

Also, the construction and use of a condenser or worm, in the manner and form and for the purposes substantially as described and set forth.

73,580.—SCISSORS.—Ransom Cook, Saratoga Springs, N. Y.

I claim as a new article of manufacture, scissors constructed and arranged substantially as herein described.

73,581.—NECKYOKE.—E. Covert and J. C. Covert, Farmer Village, N. Y.

We claim the metallic clasp, B, connecting the leather, C, to the neckyoke, A, substantially as and for the purpose set forth.

73,582.—BUTTER WORKER.—Washington Cunningham, Oxford, N. Y.

I claim, 1st, The spring roller, C, as herein set forth, which allows the compresser, A, to rise and fall, for the purpose herein set forth.

2d, Extending the side rail, E, for the purpose of preventing the carriage, F, from falling, as herein set forth.

73,583.—CHURN DASHER.—Morgan O. Davis, Warrensburg, N. Y.

I claim a dasher composed of the shaft, F, and dasher boards, a, and key, K, substantially as shown and described, and for the purpose set forth.

73,584.—CLOTHES WRINGER.—William S. Douglas, Richmond, Vt.

I claim, 1st, Regulating the pressure of the wringing rollers, d and d', by means of the levers, D and F, rod, E, and spring, e, when the same are combined and arranged substantially as described.

2d, In combination with the above, the tilting and drain boards, H and I, when the same are constructed and arranged substantially as described.

73,585.—APPARATUS FOR MANUFACTURING SHEET LEAD AND LEAD PIPE.—Andrew Dow, Brooklyn, N. Y.

I claim, 1st, The combination of the water water cylinder block, B, posts C, piston, D, cross head, E, having central bolt, F, bearing head, b, cylindrical ram, I, and annular block, G, all constructed as described, for the purpose specified.

2d, The combination of the water cylinder block, B, tube, L, vessel, K, having core, C, and annular block, G, constructed as described, for the purpose specified.

73,586.—WINDOW SASH.—A. K. Eddowes, Philadelphia, Pa.

I claim, 1st, The hollow or solid cylindrical flexible packing, D or D1, and grooved clamp or molding, D2, in combination with the rabetted frame, A, for securing the glass in said frame, essentially as shown and described.

2d, The arrangement, within the rabbet, a, of a strip or bearing, b, made of a soft and pliable material, such as gum or cork, for the standing edge of the glass to rest upon, essentially as specified.

73,587.—NAIL EXTRACTOR.—Jacob Edson, Boston, Mass.

I claim the combination of the levers, A and B, the wheel, C, and the adjustable teeth, e and l, the whole being constructed, applied, and arranged substantially in manner and so as to operate as and for the purpose or purposes set forth.

73,588.—SHOE SHAVE.—Marius M. Elliott, New England Village, Mass.

I claim a shave for boots and shoes, having its blade hung in the guard for adjustment, substantially as described.

73,589.—BOOTS AND SHOES.—Martin R. Ethridge, Locke's Mills, Me.

I claim, 1st, The new arrangement of the upper, A, and the cushion cover, B, with the wooden sole, D, and the leather sole, E, placed underneath the said wooden sole, the upper, A, and cover, B, under such arrangement, being carried around the edges of the wooden sole, and being sewed to the sole, E, as specified.

2d, And, in combination with the wooden sole, cushion cover, upper, and metallic sole, arranged as described, the finishing welt, G, applied between the upper and the metallic sole, as set forth.

73,590.—PROCESS OF RECUTTING FILES.—Albert I. Ferguson, Sharon, Pa.

I claim the combination of the within-described ingredients, when used for recutting files, substantially in the manner herein specified.

73,591.—SAUSAGE FILLER.—Martin Feuerstein, Williamsburg, N. Y.

I claim, 1st, The piston rod, i, when pivoted to the end of the bent ratchet bar, g, with which bar the piston rod is arranged, and moves parallel, substantially as herein shown and described.

2d, A machine for filling sausages, consisting of the upright cylinder, A, piston, E, piston rod, i, pivoted to the reciprocating bar, g, and of the tube, a, provided to receive and hold the removable tube, c, all made and operating substantially as herein shown and described.

73,592.—BELLOWS FOR MUSICAL INSTRUMENTS.—Oliver Follett, Pittsfield, Mass.

I claim the application of subsidiar weights or springs to the bellows of musical instruments, whereby the performer can regulate the pressure of wind by means of pedals or stops, substantially as herein specified.

73,593.—HARROW, CULTIVATOR, AND PLANTER COMBINED.—J. G. S. Garwood, Vermillion, Ill.

I claim, 1st, The combination, in one machine, of the harrow, A B, plow standards, G I, plows, H J seed box, C, dropping cylinder, D, axle, E, and wheels, F, substantially as herein shown and described and for the purpose set forth.

2d, In combination with the above, the curved spring-plate or apron, N, seed box, C, and dropping cylinder, D, substantially as herein shown and described and for the purpose specified.

3d, The combination of the slide, K, lever, L, and hook, M, with each other and with the seed box, C, and dropping cylinder, D, substantially as herein shown and described, and for the purpose set forth.

73,594.—APPARATUS FOR FILLING SIPHON BOTTLES.—Wm. Gee, New York city.

I claim, 1st, The telescopic bracket, C, adjustable substantially as described when applied to an apparatus for filling siphon bottles, for the purpose specified.

2d, The foot, G, applied to a sliding rod, D, and arranged to operate in connection with the bracket, C, and the parts thereto attached, substantially as and for the purpose specified.

3d, The adjustable notched collar, j, on the part, a, of the bracket, C, in combination with the pin, h, of the arm, g, of the guard, H, all arranged substantially as and for the purpose specified.

73,595.—STEAM GENERATOR.—H. Gerner, New York city.

I claim a steam boiler, having a conical flue, F, situated in a conical shell, E, which is surrounded by cylindrical shells, A D, substantially as herein set forth.

Also, the combination of the conical flue, F, with the conical shell, E, and with the grate, G, substantially as and for the purposes described.

73,596.—ICE CREAM FREEZER.—Charles Gooch, Cincinnati, Ohio.

I claim the internal spur wheel, K, in combination with the wheels, L and M, substanatially as herein described, for the purpose of securing an opposite motion to the agitator and the can.

73,597.—VEGETABLE CUTTER.—George P. Hachenberg, Coxsackie, N. Y.

I claim the combination of the stationary vessel, A, revolving toothed ring D, having flange, F, under the lower edge of the vessel, A, slotted revolving disk, G, fitted by slots, a, upon the lugs, b, of the toothed ring, cutters, I, adjusting screws, K, sockets, J, fixed bar, M, in the vessel, A, follower, N, and gear wheel, Q, all operating as described for the purpose specified.

73,598.—ROLLING MACHINE.—George Hastings, Jr., Wheeling, W. Va.

I claim, 1st, The rollers, C D and E, and the riders, carriages, and boxes, F G and H, with the supporting rods, J J, combined and arranged substantially as shown and described for the purposes set forth.

2d, The collars, N, grooves, O, and clutch coupling, M, in combination with the rollers, C D E, sides, and carriages, and boxes, F G H, and supporting rods, J, as herein described, for the purpose specified.

3d, In three high rolls, connecting the middle and upper rolls, so that they shall move up and down together, substantially as shown and described.

73,599.—LAMP.—Hiram W. Hayden, Waterbury, Conn.

I claim a perforated chamber, h, and deflector, g, fitted to slide vertically upon the wick tub, in combination with the chimney holder, sustained by arms to the burner cap, substantially as and for the purposes set forth.

73,600.—LAMP.—Hiram W. Hayden, Waterbury, Conn.

I claim, 1st, A chimney holder, connected permanently to the burner shell, and provided with a short deflector, in combination with a stationary wick-tube, and arranged as set forth, so that access is given below the chimney holder for trimming the wick, as set forth.

2d, Also, a sliding perforated cup, having a bottom with a slot for the wick tube, and applied between the burner shell and chimney holder, substantially asset forth

3d, Also, the perforated cup, k, stud, e, deflector, g, and chimney holder, f, in combination with the burner and wick tube, h, substantially as and for the purposes set forth.

4th, Also, a friction spring in combination with the perforated cup, k, for sustaining the same at any point to which it may be moved, as set forth.

73,601.—WASHING MACHINE.—Henry Helm, Pittsburgh, Pa.

I claim, 1st, The elastic rings, e, upon the grooved wheels, r, of the rollers, H, attached, by the elastic strips, a, to the central elastic ring, e', upon the shaft, D, all constructed and operating as described for the purpose specified.

2d, The combination of the rollers, r, washer, W, strips, f, box, T, divided into three compartments by the vertical partitions, u, crank wheel, W, rods, C, treadle, t, pivoted seat, S, as herein described, for the purpose specified.

3d, The combination of the elastic rings, e e', and elastic strips, a, with the rollers, H, shaft, D, and vibrating washer, W, as herein described, for the purpose specified.

73,602.—STEAM ENGINE GLOBE VALVE.—H. H. Hendrick, Dayton, Ohio.

I claim, as a new article of manufacture, a disk valve, B, formed of chilled or case-hardened iron, in the manner described, and loosely attached to the stem, substantially as shown and specified.

73,603.—ARTICLES MADE OF MOLDED WOOD.—Samuel B. Henry, Bridgeport, Conn.

I claim a block or strip of molded wood, the fibers of which have been displaced by the action of dies applied to the end grain, as described, and the pores of which are filled with rubber, or its equivalent, applied in solution.

73,604.—LATHING MACHINE.—Thomas Hill, New Centerville, Wis.

I claim, 1st, The stand, A, in combination with the sliding or adjustable frame, B, when used in connection with bars, G, in which laths are clamped or secured, and all arranged in the manner substantially as and for the purpose set forth.

2d, The sliding or adjustable frame, C, connected with the lever frame, G x, by the racks and pinions, D E, when said parts are used in connection with the frame, B, and the bars, G, provided with the slides, l, and arranged to operate in the manner substantially as and for the purpose specified.

3d, The slides, l, and springs, m, placed on the rods, J, within the bars, G, and arranged to operate in connection with the frame, C, substantially as and for the purpose set forth.

4th, The rods, o o, arranged with the notch, r, frame, C, springs, g, and the plates, a and t, to operate in connection with the slides, l, of bars, G, substantially in the manner as and for the purpose set forth.

5th, The clamps, I, applied to the bar, J, in combination with the bars, G, and the slides, l, which hold the laths, all arranged substantially as and for the purpose specified.

73,605.—GRAIN SEPARATOR.—Orsamus Holmes, New Lenoxville.

I claim the bars, S, pivoted near their centers, U, to the frame of the machine supporting the straw shoe, B, their lower ends pivoted to the grain shoe, T, whose outer end is supported by the pivoted bars, V, all arranged as described whereby the movements of the straw shoe, B, and the grain shoe, T, are simultaneous, as herein set forth for the purpose specified.

73,606.—PLOW.—W. T. Howell, Alfred, N. Y.

I claim the attaching of the share, E, to its standard, D, by means of the band, F, fitted on the cylindrical parts b of the standard, the pin, c x, on which the band rests and the brace rod, F x, fitting in the recess oo depression, n, in the top of the share, all arranged substantially as shown and described.

73,607.—PLOW.—David W. Hughes, Quincy, Ill.

I claim, 1st, The placing of the plows at the outer sides of the wheels, B B, substantially in the manner as and for the purpose set forth.

2d, Having the plows or shares, I J, placed in reverse oblique positions for the purpose of dispensing with a land side to avoid friction and draft and to keep the implement in line with the of draft, as set forth.

73,608.—STEAM GENERATING APPARATUS FOR HEATING BUILDINGS.—Benjamin Irving, New York city.

I claim, 1st, The combination and arrangement of the dampers, N and S, made and operating substantially as hereinbefore set forth.

2d, Also, in combination with the coils of pipe, and dampers, N and S, the perpetual reservoir of water, E, made and operating substantially as hereinbefore set forth.

3d, Also the combination and arrrngement of the nozzle, H, with funnel, I, substantially as hereinbefore set forth and for the purpoees described.

73,609.—CLOTHES PIN.—David D. Jones, Scranton, Pa.

I claim the pins, A and B, pivoted together at one end and provided with the collar, C, and spring, D, the several parts being constructed and used as and for the purpose specified.

73,610.—CONCRETE BUILDING BLOCK PRESS.—Orlan L. Jordan, Dowagiac, Mich.

I claim the combination of the frame, A, with box, B, bars, G F, lever, E, follower, D, bars, I I, and lever, H, the whole being constructed, arranged and operating in the manner substantially as and for the purposes set forth.

73,611.—FENCE.—DANIEL Kaufman, Boiling Springs, Pa.

I claim, 1st, The fence posts, A, when supported above the ground by means of the metallic shoes, D, pivoted to the lower ends of the inclined braces, C, as herein described for the purposes specified.

2d, The posts, A, formed of two parts slotted for the reception of the rails, B, the ends of the rails of one panel fitting against the ends of the rails of the opposite panel in the center of said posts in combination with the braces, C, horizontal pieces, e1 e2, and metallic supporting shoes, D, as herein described for the purpose specified.

73,612.—CURTAIN FIXTURE.—C. F. Knauer, Pittsburg, Pa.

I claim, 1st, The pulley bearing, B, with its aperture or flanges, i, slots, c, arranged and constructed substantially as described and for the purpose set forth

2d, The cord pulley, D, provided with teeth, e, on its periphery and journals, J, when arranged and operated in combination with the cord, E, substantially as described and set forth.

73,613.—OX YOKE.—Joseph Langenbach, Dorchester, Iowa.

I claim, 1st, The padded bows, B, made in two parts and pivoted within slots in the stock, A, when provided with a series of holes, d, in the tenons, a, all constructed, arranged and operating substantially as and for the purpose described.

2d, Providing the stock and the upper ends of the bows or either with a series of set holes substantially as described so as to make the yoke adjustable for larger and smaller animals, as set forth.

73,614.—TRUSSES AND ABDOMINAL SUPPORTER.—Jules Lecocq, New York city.

I claim forming trusses, abdominal supporters, etc., of wire, A, bent into the form required and covered with rubber tubing, B, substantially as herein shown and described and for the purpose set forth.

73,615.—MACHINE FOR SAWING HOOPS.—Abraham Lutz, Orangeville, Ill, Antedated January 17, 1868.

I claim the construction and arrangement of the inclined fixed bearing, E, having the pin, e, and concave head, e', spring, F, provided with the horizontal roller, G, and bent spring, H, with concave arm, b, as herein shown and described for the purpose specified.

73,616.—MACHINE FOR MOLDING PEAT.—James B. Lyons, New Haven, Conn., assignor to Lyons Peat Coal and Machine Company, New York city.

I claim, 1st, Delivering the peat in rolls or bars on the drying racks, for the purposes set forth.

2d, The revolving marker, E, with its blades, e e e e, as arranged in combination with the delivering mechanism and drying racks, substantially as herein described for the purpose described.

73,617.—MARINE FOUNDATION.—Edward Manico, London, Great Britrin, assignor to John P. Manico, New Orleans, La. Patented in England October 23, 1867.

I claim the combination of parts and articles herein described when the same are used for obtaining foundations for marine and other structures requiring them.

73,618.—COMBINED POTATO PLANTER, HOE AND POTATO DIGGER.—Francis B. Marden, Bangor, Me.

I claim, 1st, The mode of operating the shaker, F, by an eccentric, b, and pitman, f, so arranged and connected with the hanging irons, j j, that by raising or lowering the handles to any given point, it does not prevent the free and easy working of the shaker, F.

2d, The digging point, G, shaker, F, finger reel, E, comb, P, with the eccentric, b, pinion, a, and driving wheel, C, in combination with the journal boxes, h h, having projecting axles, i i, for attaching the draft irons, j j, when constructed and arranged substantially as and for the purposes herein set forth.

73,619.—HARVESTER RAKE.—Jas. S. Marsh, Lewisburg, Pa.

I claim, 1st, The combination, substantially as described, of a main frame supported upon two wheels, and a laterally projecting platform and cutting apparatus, so hinged to the main frame that the cutting apparatus shall be in advance of the main axle, with a series of combined rake and reel arms, all revolving on a vertical axis, or one nearly so, on a support mounted on the platform, near its inner front corner, for the purposes set forth.

2d, The combination, substantially as described, with a two-wheeled front-cut harvester, of a series of combined rake and reel arms having a vertical axis, or one nearly so, on a standard or support, mounted on a hinged platform, near its inner front corner, the arms being independently hinged, and having a rising and falling movement independent of their axis of rotation, for the purpose set forth.

3d, The combination, substantially as described, with a two wheeled front-cut harvester, of the main frame between the wheels, the intermediate hinged coupling arms F1 G, the cutting apparatus, and platform, and a series of rake and reel arms pivoted to a crown wheel or central hub revolving on a vertical axis, and driven by an extensible connection from the main axle for the purposes set forth.

4th, The combination, substantially as described, of two driving wheels, a frame arranged between the wheels, and projecting beyond their periphery at either end, a laterally projecting cutting apparatus, and platform pivoted to said frame by hinged connections, both in front and rear on the wheels, the cutting apparatus being in advance of the main axle, and a combined rake and wheel, revolving on a vertical axis near the inner front corner of the platform, and always revolving outside of the wheels, for the purposes set forth.

5th, The combination, substantially as described, in a two-wheeled front-cut hinged-bar machine, of a combined rake and reel, mounted on the inner front corner of a platform, suspended from the main frame by flexible connections attached to the coupling arms, and with the lifting devices attached to the rear end of the tongue, for the purposes set forth.

6th, Attaching each of the rake or reel arms to their pivoted shanks by means of a slot and set screw, or bolt, so that these arms can be adjusted and set to work at different hights above the platform, to suit different hights of grain, substantially as described.

7th, The combination, substantially as described, with a combined rake and reel, mounted on the inner or gearing side of a grain platform, of the divider, D1, and inwardly inclined removable deflecting board, D3, for the purposes set forth.

8th, The combination, substantially as described, with a revolving rake and reel mounted on a hinged platform, of an adjustable inner grain guard, E, attached both to the shoe and to the inner curved guard, D4, for the purposes set forth.

9th, The combination, substantially as described, with a two-wheeled front-cut machine, having a revolving rake and reel mounted upon a hinged platform, of a lateral hinged curved brace or coupling arm, or its equivalent, attached to the inner side of the platform and main frame, in rear of the wheels, and suspended from the main frame by a chain or other flexible connection, for the purposes set forth.

10th, The folding joints, g g, or their equivalents, as a means of communicating motion to rake or reel arms, which are so supported as to move in harmony with a hinged platform, substantially as described.

73,620.—BUCKLE.—C. W. Martin, Mount Pleasant, Iowa.

I claim, 1st, The buckle constructed as described, whereby the trace is passed under the end bar, F, of the part, B, and over the covex side of the plate, H, under the notched bar, F, over the tongue, M, and beneath the bar K, as and for the purpose specified.

2d, The buckle constructed as described, consisting of the S-shaped frame, B, having the loop, G, and concavo-convex plate, H, and provided with the lugs, D, to which the curved frame, C, is pivoted, said frame having the cross bars, K L, and tongue, M, fitting into the notch, N, of the end bar, F, of the part, B, as herein shown and described.

73,621.—LUBRICATING CAR WHEELS.—Wm. W. Martin, Allegheny City, Pa.

I claim the reservoir, A, provided with projection, O, furnished with an opening, 3, for communicating between the reservoir, A, chamber, n, and opening, B, for the axle, the whole being constructed, arranged, and operating substantially as herein described and for the purpose set forth.

73,622.—BED BOTTOM.—Nathan Maxey, Plymouth, Ind.

I claim the slats, C C, provided with loops, D D, and collars, G G, and connected to the side rails and end rails by the springs, I I and a a, and staples, H and e, substantially as and for the purpose set forth.

73,623.—HARVESTER RAKE.—J. B. McCormick, St. Louis, Mo.

I claim, 1st, operating the pivoted rake head, H, by means of the fixed cam G, into the groove, f, of which the outer end of the rake arm, F, is fitted, in connection with the rods, j k, and the bent lever, I, all arranged to operate in the manner substantially as and for the purpose set forth.

2d, The hinged table, M, operated through the medium of the eccentric N, from the driving wheel, B, substantially as set forth.

3d, The combination of the rake, H, and hinged table, M, constructed and arranged for joint operation in the manner substantially as and for the purpose specified.

73,624.—GATE LATCH.—C. E. Merrifield, Indianapolis, Ind.

I claim, 1st, The catch, G, formed by a series of parallel flanges, in combination with a horizontally swinging latch, F, substantially as described.

2d, The combination and arrangement of the shank, C, arm, D, bell-crank formed lever, E, and latch, F, substantially as set forth.

73,625.—ANIMAL TRAP.—John H. Miller, Vernon, Ind.

I claim an animal trap constructed with a case, A, subdivided into compartments with the openings closed by doors, C C' K and L, which are actuated by means of the platforms, G and H, trigger, F, shaft, D, and arms, E and I, arranged to operate substantially as set forth.

73,626.—HARROW.—Nicholas B. Miller, Orion, Mich.

I claim the frame, A, teeth, D D, bars, B B, with wheels, C C, and wheel, E, when constructed, combined, and arranged as and for the purposes specified.

73,627.—PAINT COMPOUND.—John D. Mills, Dayton, O.

I claim the composition of the above-named ingredients as a paint, and to be applied as I apply them, by grinding, bolting, oiling, and painter's brush.

73,628.—FLOUR SCOOP AND SIFTER.—Rufus S. Mitchell, Elizabeth, Ind.

I claim a flour scoop, consisting of the sides, A, having shoulders, a, lip, D, sieve, B, wooden back, C, beater, E, and spring, F, all constructed, arranged, and operating as and for the purpose set forth.

73,629.—CORN HARVESTER.—H. Molby, Davisburg, Mich.

I claim, 1st, In combination with the frame, A, provided with the rack, D, and cords, d d, and standards, a a, the hinged frame, C, rotary cutter, cord, s, and lever, T, arranged in the manner and for the purposes set forth.

2d, The revolving platform, K, with its bars, L L and R, for supporting the cornstalks, and operating as and for the purpose specified.

3d, The arrangement of the cutter wheel, O, with the revolving platform, K, and the reels, P and q, substantially as and for the purpose specified.

73,630.—CULINARY APPARATUS.—T. W. Moore, N. Y. city.

I claim, 1st, Providing the inner side of the channel, a, at the joints with holes or recesses, substantially as and for the purpose herein shown and described.

2d, The inclined channels, c, when arranged within the vessels, B and G, along their walls, for conducting the condensed steam back to the boiler, substantially as herein shown and described.

3d, The steam-way, D, when arranged as described, so as to convey the steam from the boiler into the upper vessels, B C, and to reconduct the condensed steam to the boiler, as set forth, the steam-way being either attached to the upper vessel, B C, or to the boiler, or both, as described.

4th, The perforated pipe, D, when arranged as set forth, in combination with the recessed or perforated flange of the channel, a, and with the inclined channel or channels, c, all made and operating substantially as and for the purpose herein shown and described.

5th, Making the bottoms of the vessels, B and C, inclined to one or more sides, so as to guide the liquids to a certain desired point or points, as set forth.

6th, The vessels, B C, having inclined bottoms, and provided with pipes, E, and steam pipes, D, in combination with a vessel, F, as and for the purpose described.

7th, The vessels, A B C, when provided with perforated channels, a, and steam pipes, D, and when otherwise made as described, in combination with the channel or channels, c, pipe or pipes, E, and vessel or vessels, F, all made and operating substantially as herein shown and described.

73,631.—MODE OF CONVERTING RECIPROCAL INTO ROTARY MOTION.—Duncan Morrison, Portland, Me.

I claim the weighted swinging arm, a, swinging on the pivot, b, and the two pawls, c d, one above and the other below the pivot, b, and operating upon the gears, e f, alternately, so as to impart to the shaft, g, a continuous revolving motion, as described, together with the standard, x, catch, w, rod and pulley, u t, all arranged and operating for the purposes set forth.

73,632.—TOP PROP FOR CARRIAGE.—John F. Mullen, New York city.

I claim the screw, f, constructed and applied substantially as and for the purpose described.

73,633.—BUCKLE.—Heimann Neumann, New York city.

I claim the arrangement of a notch or recess in the side bar, G, of a buckle frame, substantially as and for the purpose described.

73,634.—STEAM GENERATOR.—Augustus W. Newell, Bradford, Pa.

I claim the construction of an adjustable fire-box, as hereinbefore described, provided with suitable fastenings, C C, steam pipes, D, with expansion joints, E, and proper water pipes, F, arranged substantially as and for the purposes described.

73,635.—ARCADE RAILROAD.—Samuel B. B. Nowlan, New York city.

I claim the arcade road and railroad, constructed and arranged as described, consisting of the roadways, A B and C, the upper roadway supported by iron columns, D, and having gas and water tubes, a, and the second by masonry, through which the sewers, c d, and pneumatic dispatch, K, pass said roads provided with open spaces, F, for the admission of light, and having the stairways, E, substantially as herein shown and described, for the purpose specified.

73,636.—TIN-WARE SEAMING MACHINE.—H. J. Noyes, Ashtabula, Ohio.

I claim, 1st, The adjustable rotating-gage pressure-head, E, with the spring, F, and support, E'', constructed and operating substantially as specified.

2d, The inclined rotating pressure-head, B, when constructed substantially as shown, and operating on the seam of the ware in the manner stated.

3d, The rotating seaming-head, A, and slotted bearing, C', constructed and operating as described, in combination with the said pressure-head, B and adjustable-gage pressure-head, E, as and for the purpose specified.

73,637.—DRY HOUSE FOR FRUIT, ETC.—L. A. Oellig, Martinsburg, Pa.

I claim a circular dry house, made in sections, of sheet iron, or other suitable material, with drawers, furnace, pipes, and slides, aranged substantially as described.

73,638.—MACHINE FOR FINISHING THE EDGE OF BOOT AND SHOE SOLES.—Charles W. Palmer, Lynn, Mass.

I claim, for the purpose of finishing the edges of detached soles, the machine constructed and operating substantially as described.

73,639.—AIR WHISTLE.—C. H. Parshall, Detroit, Mich.

I claim the combination of the pump, B, the air chamber, C, the cylinder, E, plunger, K, and whistle or horn, A, constructed and arranged to operate substantially as set forth.

73,640.—APPARATUS FOR TREATING CANE JUICE WITH SULPHUROUS ACID.—John E. Pattison, Thibodeaux, La.

I claim, 1st, A stationary cylinder, A, in combination with revolving troughs, E, one or more, or their equivalents, said troughs being contained within said cylinder, and employed to raise and drop the juice in order to bring it under the effective action of sulphurous acid, substantially as described.

2d, The projection or partition, F, arranged and employed in the manner and for the purpose set forth.

3d, The provision in the troughs, E, of the partitions, e', substantially as and for the purpose set forth.

73,641.—HARVESTER.—Henry W. Pell, Rome, N. Y.

I claim, 1st, The segmental strap or guide way, D, mounted on the tongue, A, in combination with the lever, G, substantially as set forth.

2d, The lever, G, in combination with the draught chain, I, connected to the frame, B, substantially as and for the purposes specified.

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3d, Mounting the whiffletree bolt in line with the tongue, or nearly so, upon the center of a lever fulcrumed at one end, and at the other connected by a draught chain to the frame of the machine, substantially as described.

73,642.—HARVESTER.—Henry W. Pell, Rome, N. Y.

I claim, 1st, The longitudinal bar, C, connected at each end to the tongue, by swinging arms, B B', and carrying a stud or bolt, D, on which the doubletree and draught clevis are mounted, substantially as and for the purposes set forth.

2d, One or more pairs of swinging arms, B, supporting the draught clevis and whiffletree bolt, vertically and laterally, and permitting their free play longitudinally beneath the tongue.

73,643.—BARRELS AND CASKS FOR CONTAINING OILS, ETC.—Antonio Pelletier, Washington, D. C.

I claim, 1st, The composition, consisting of silicate of soda and red lead united, as a coating for oil barrels and similar vessels, as described.

2d, Also, as a new article of manufacture, an oil barrel or similar vessel, when coated with the composition herein described.

73,644.—GARDEN PLOW.—David Petticrew, Westville, Ohio.

I claim a garden plow, constructed with a single shovel, A, standard, B, handles, E, beam, C, and wheel, G, said parts being respectively constructed and arranged substantially as set forth.

73,645.—CONCRETE ROOFING.—Samuel B. Pierce, and Pembroke Pierce, Homer, N. Y.

We claim the mixture of the above-named ingredients, when used substantially as and for the purpose specified.

73,646.—CHRONOMETER ESCAPEMENT.—Albert H. Potter, Williamsburgh, N. Y.

I claim the pallets, B and B', rigidly attached to the arbor, K, in combination with the obtusely pointed toothed escape wheel, A A A, lever C, fork, L, pin, Q, roller, R, and pallet, D, all constructed, arranged, and operating substantially as herein described and specified.

73,647.—MACHINE FOR CUTTING DYE WOOD.—Onsville E. Pray, Portsmouth, N. H.

I claim the drum, B, constructed as described, its radial arm, c, provided with chambers, d, in their outer ends for the reception of the adjustable cutters, C, and the periphery of said wheel, provided with transverse slots, dx, as herein described for the purpose specified.

73,648.—TOOL.—Andrew J. Prescott, Catawissa, Pa.

I claim, 1st, The cutter shaft, B, provided with the cutting projection, a, pivoted in a slot in the mandrel, through an elongated hole, and adjusted in one direction by means of the pivot screw, 2, substantially as herein set forth, for the purpose specified.

2d, The feed-nut, D, provided with a flaring mouth, in combination with the stop screw, 1, mandrel, A, and the cutter shaft, B, constructed substantially as and used for the purpose set forth.

73,649.—CORN PLANTER.—William Rayhill, Pana, Ill.

I claim the bars, D D, wheel, C, with its cams, slide, F, and seed slides, G G, of the hoppers, arranged and used with the frames, A A', standard, J, bar, K, and lever, I, substantially as and for the purpose set forth.

73,650.—HORSE HAY FORK.—Elias Rhodes, Sr., Clyde, Ohio.

I claim the cross piece, or head, H, in combination with the bolt or slide, I, lever, J, spring, K, rod, D, and shaft, A, all constructed, combined, and arranged to operate in the manner set forth.

73,651.—HAMES FASTENER.—William A. Robinson, Grand Rapids, Mich.

I claim the combination of the grooved and ratchet bars, A and F, with the spring, a, and loose loop, E, said loose loop operating in connection with the shoulders, b and C, substantially as and for the purposes set forth.

73,652.—CANDLESTICK OR HOLDER.—S. J. Rockwood, Elsah, Ill.

I claim the conical or tapering-shaped socket or tube, D, for holding a candle, substantially as and for the purpose described.

73,653.—PULLEY AND BLOCK.—Samuel Roebuck, and John Roebuck, New York city.

We claim the block, A, when combined with the rollers, C and B, of which the latter is provided with concentric and eccentric grooves, substantially as and for the purpose herein shown and described.

73,654.—ROTARY BLOWER.—P. H. Roots, and F. M. Roots, Connersville, Ind.

We claim, 1st, The packing strips, g g, arranged substantially as herein shown and described, upon the interior surface of the case of a rotary blower, pump or engine, to render the same tight.

2d, The abutments, A B or A' B', in combination with an inclosing case, rendered tight by means of packing strips, substantially as and for the purpose set forth.

73,655.—SAFETY POCKET.—Abbott Q. Ross, Cleves, Ohio.

I claim the within-described pocket safe, composed of the arms, A A, provided with the slide, C, lock catch, d, teeth, e e, and blade, f, the whole combined and arranged as herein set forth.

73,656.—SUB AQUEOUS TUBE.—Thomas F. Rowland, Greenpoint, N. Y.

I claim the application to the exterior of a sub aqueous iron tube of blocks composed of cement, tile, or other suitable material, secured to the tube by tongues, and grooves, and bolts, in the manner substantially as herein shown and described.

73,657.—LIFTING JACK.—Elias Shopbell, Ashland, Ohio.

I claim the standard, A, provided with a tenon, a, and pivoted at A' to the lever B, the rack, C, passing through a slot in the lever, and pivoted at b to the standard, when arranged and combined as herein described, for the purpose set forth.

73,658.—ICE CREAM FREEZER.—F. G. Siemers, Winona, Minn.

I claim, 1st, An ice cream freezer, provided with vertically moving, concave scrapers, arranged to operate substantially as described and for the purpose set forth.

2d, The combination of the rotating case, B, and vertically moving concave scrapers, L, when constructed and arranged to operate substantially as described.

3d, The rotating case, B, provided with the socket, O, and the locking stud, d, constructed and arranged to operate as set forth.

73,659.—CHURN.—Isaac J. Siler, Arcanum, Ohio.

I claim the spiral arms, F, and their arrangement with reference to the two shafts, C C, forming a churn dasher, substantially as and for the purpose specified.

73,660.—BILLIARD TABLE CLOTH.—Darius Skidmore, Seneca Falls, N. Y.

I claim a new manufacture of billiard table cloth, consisting of cotton, linen, or other cloth, coated on the surface in the manner of preparing oil cloth, but with dead colors, substantially as and for the purpose described.

73,661.—HINGE.—John Sowle, Boston, Mass.

I claim slitting or dividing the pin or spindle, a, made of tempered steel or other metal, so that it will produce the required degree of friction within the hinge, substantially as and for the purpose set forth.

73,662.—FIRE GRATE.—Henry Speeler, Trenton, N. J.—Antedated Dec. 21, 1867.

I claim the within described grate bar, A, provided with the tube, B, bent as described, the upper portion of said bar and tube being perforated as specified, and used substantially as and for the purpose set forth.

73,663.—LAMP.—Charles F. Spencer, Rochester, N. Y.

I claim, 1st, So arranging and combining the parts of the burner that the chimney is located below the level of the spur wheel shaft, and in close contact with the lamp body, and made to enclose the said shaft, as herein set forth.

Also, the combination with the chimney of any suitable gear that will impart motion to the wick by simply turning the chimney, as herein set forth.

Also, the arrangement of the revolving cap, C, serving both as the support for the chimney and as the gear for actuating the wick, as herein set forth.

73,664.—LAMP.—Stephen Spoor, Phelps, N. Y.

I claim a shade, E, within the chimney, A, arranged and operating substantially as and for the purposes herein set forth.

73,665.—PUDDLING FURNACE.—Wm. Stevenson, Allegheny City, Pa.

I claim in combination with a puddling furnace, the beater, G, arranged substantially as and for the purposes described.

73,666.—LOCKING KNOB LATCH.—H. C. Storrs, N. York city.

I claim the combination of the locking bar, b, pivoted to the latch bolt, with the bolt, F, and latch bolt, B, substantially as shown and described.

73,667.—WASHING MACHINE.—B. F. Stover, Ladoga, Ind.

I claim the arms, I and J, and rods, a and b, and uprights, K, combined substantially as shown, with the roller, H, and bottom surfaces, F and G, all as set forth.

73,668.—WHEEL TIGHTENER.—Enoch Swain, Lewistown, Pa.

I claim the combination of the circumferential grooved tire, s, with the screws, C D, and spoke, constructed as described, for the purposes set forth.

73,669.—RULING MACHINE.—J. F. Tapley, Springfield, Mass.

I claim the combination with the drum, B, of two sets of adjustable cams, c c, etc., one set at one end of the drum operating the pen board, or bar, and the other set the stop gate, substantially as shown.

73,670.—ADJUSTABLE SPIRIT LEVEL.—Wm. J, Tate. New Haven, Conn.

I claim, 1st, The adjustable spirit level, consisting of the box, B, provided with the perforated projections, a, through which the screw bolts, b, surrounded by the springs, d, pass, and the adjusting nuts, c, working in the recesses of the case, A, as herein described, for the purpose specified.

2d, The combination of the adjusting nuts, c, and springs, d, with the perforated flanges, a, of the box, D, and the screw bolts, b, as herein described, for the purpose specified.

73,671.—DRAWER TRUSS.—Zalmon Taylor. New York city.

I claim the strap, C, or its equivalent (when the pad is arranged therein substantially as and for the purpose set forth), whether the same is elastic or non-elastic.

73,672.—GAGE COCK FOR BOILERS.—Wm. G. Thomas, Centralia, Pa.

I claim the combination of the screw, E, with the valves, D and H, and parts, B and C, substantially as shown and described.

73,673.—KNIFE CLEANER.—Ira F. Thompson, Providence, R. I.

I claim, 1st, The knife cleaner formed of the rubbers, f, introduced within the box, a, and provided with the pins or screws, g, as and for the purposes set forth.

2d, Also the elastic septum, c, fitted as specified, in combination with the said rubbers, f, box, a, and pins or screws, g, as and for the purposes specified.

73,674.—PAPER CUTTER.—Theo. R. Timby, Saratoga, N. Y.

I claim, 1st, The paper cutter so constructed that when the knife is thrust out its cutting edge will form an acute angle with the edge of the case.

2d, The slot, F, adapted and employed to guide the paper to the edge of the knife, substantially as set forth.

73,675.—HOOF EXPANDER.—John Tipton, Malaga, Ohio.

I claim the instrument above described, when constructed substantially as and for the purpose specified.

73,676.—FEEDING APPARATUS FOR FLOCKING MACHINES.—Henry Turner, New York city.

I claim, 1st, The automatic feeding apparatus for flocking machines, consisting of the box, A, provided with stirrers or agitators, m, in combination with the apron, E, when the same is provided with cups, f f, and in combination with the plungers, J and K, and hopper, F, all made and operating substantially as herein shown and described.

2d, The plungers, J K, when made of different lengths, and when attached to cranks that project from the rock shaft at different angles, substantially as and for the purpose herein shown and described.

73,677.—CORKSCREW.—George Twigg, Birmingham, England.

I claim, 1st, The handle, e, in combination with the shank, a, swivel, f, and nut, d, as shown in fig. 1, substantially as described, for the purpose specified.

2d, The handle, e, in combination with the set screw, i, and groove, k, as shown in fig. 6, substantially as described, for the purpose specified.

3d, The handle, e', in combination with the screw, a, pin, l, and clutch piece, m, as shown in fig. 8, substantially as described, for the purpose specified.

4th, The rubber ring or band, v', fig. 3, in combination with any bell or barrel, b, fig. 1, substantially as shown and described and for purposes set forth.

4th, The split barrel, w, fig. 14, in combination with the ring or ferrule, r, substantially as shown and described and for the purposes set forth.

73,678.—BUCKET FOR DREDGING MACHINES.—Thos. Walsh and Augustin Walsh, New York city.

We claim the arrangement of the jointed levers, c, shaft, b, guide rods, h, shaft, d, chain, e, and buckets, a a', when the shaft, d, is adapted to be drawn down to the shaft, b, by the chain, e, for opening the buckets, the guide rods h, passing through the shaft, d, as herein shown and described.

73,679.—RAILROAD RAIL CLAMP OR CHAIR.—John E. Watkins, Smithfield, Ky.

I claim, 1st, The combination of the flanged clamp, C, brace key, K, and tightening key, F, when secured in position upon the rails by means of the spikes passing through the flange, C1, the key, K, and the base plate, C, upon the outside of the rail, and by the wedge-shaped spikes, A, passing through the flange, C3, key, F, and base plate, C2, upon the inside of the rail, as herein shown and described for the purpose specified.

2d, The combination of the flanged or dovetailed clamp, C, brace key, K, tightening key F, and wedge-shaped spikes A, with each other, substantially as herein shown and described and for the purpose set forth.

73,680.—FASTENING METALLIC COLLARS TO BOTTLES.—Edward Wattis, Jr., Philadelphia, Pa.

I claim, 1st, Fastening the collars to the necks of bottles by spinning or expanding the metal beneath the projecting lips or flanges of bottles when the necks are not grooved, or by spinning the same into a groove or grooves in the neck, substantially as described.

2d, Preventing the metallic collars of bottles from turning round by forming one or more flat sides on the lips or flanges, and fitting the collars thereto, substantially as described.

73,681.—CAR COUPLING.—William Weiler, Washington, N. J.

I claim the catch, f, and lever, h, arranged on one of the bumpers of a railway car, for supporting and releasing the link, substantially as set forth.

73,682.—HYDRO-CARBON BURNER.—James Haley White, San Francisco, Cal.

I claim, 1st, The combined use of the products of decomposed steam and wet or ordinary steam, each being introduced separately, and in such proportions as may be required, into a gas holder or mixer, for the more perfect combustion of the vapor of hydro-carbon oils, substantially as described.

2d, The superheating and decomposing apparatus, consisting of the cylinders, J J', and I, and the gas or supply tube within the mixer or holder, D, substantially as described.

3d, The horizontal cylinders or mixers, D D, having openings or burners entirely around their circumference, on the under side as well as the others, which causes them to be more effectually heated, and also prevents their filling or being clogged by a residuum.

4th, The combination and arrangement of the interior perforated tubes or pipes, F g, and d, with the exterior cylinders, or mixers, D D, substantially in the manner and for the purposes set forth.

5th, In combination with the above claimed apparatus, the perforated air tube, L, for supplying hot air to render the combustion of the vapor and gases issuing from the mixers more perfect.

73,683.—COTTON PRESS.—Paul Williams, Winona, Miss.

I claim, 1st, Combining the lever beams, A, with the screw, H, follower, J, and thrust beam, M, to form a cotton press, substantially as shown and described.

2d, The partially revolving tap, I, combined with its recess, m, and the screw, H, and lever beam, A, of a cotton press, substantially as shown and described, and for the purpose specified.

73,684.—WAGON FOR UNLOADING COAL.—J. H. Wood, Trenton, N. J.

I claim, 1st, The attachment of a funnel shaped or incline mouth, D, of any material, to the rear or side of a cart or wagon, as herein described, and for the purpose set forth.

Also, the valve or gate, E, at the end of the mouth, D, or in the chute or tube, G, when combined, as herein described, and for the purpose set forth.

Also, the hinged or sliding chutes or tubes, H, when attached to an open mouth, or to the end or side of a cart or wagon, for the purpose herein set forth.

73,685.—PLOW.—Alexander Wright, Allegheny City, Pa.

I claim a plow, constructed, arranged and operating substantially as herein described, and for the purpose set forth.

73,686.—WAGON CLIP.—George S. Zeigenfuss, Doylestown, Pa. Antedated Jan. 16, 1868.

I claim the segmental head, d, having a screw, e, which passes diagonally through the curved projection, a, on the end of the thill iron, A, for the purpose of securing the looped thill iron, B, all constructed and used as specified.

REISSUES.

2,847.—HAND STAMP.—E. D. Chamberlain, Westfield, N. J., and Charles H. Brown, New York city, assignees of D. H. Chamberlain.

We claim, 1st, The combination, with a die in a hand stamp, of type wheels of different diameters, substantially as and for the purpose specified.

2d, The die holder, F, constructed and combined with the lever end, c', substantially as and for the purpose shown and described.

3d, Making the type wheels, a b c, of different diameter, rotating upon separate and distinct axes, a' b' c', substantially as and for the purpose shown and described.

4th, The combination of the inking ribbon with the type wheels, substantially as herein described, so as to present a double fold of the ribbon under the type wheels, all as set forth.

PENDING APPLICATIONS FOR REISSUES.

Application has been made to the Commissioner of Patents for the Reissue of the following Patents, with new claims as subjoined. Parties who desire to oppose the grant of any of these reissues should immediately address MUNN & CO., *37 Park Row, N. Y.*

58,268.—GATE FASTENING.—Richmond A. Leeds, Stamford, Conn. Dated Sept. 25th, 1866. Application for reissue received and filed Jan. 8th, 1868.

I claim, 1st, The arrangement of a catch for gates, composed of one or more vertically moving plates or bolts, horizontally across the face of the front stile of the gate, when used in combination with a lug or projecting piece secured to the fence post, substantially as and for the purpose herein specified.

2d, A latch for gates consisting of two eccentrically hung bolts or plates, D, provided with handles or arms, E, and arranged within an enclosing case, F, in combination with a lug or projecting piece, H, substantially as herein specified.

36,673.—STUMP EXTRACTOR.—Samuel B. Smith, E. J. Genet, and Samuel M. Longley, New York city, and Andrew C. Getty, Hudson, N. Y., assignees of Solomon W. Ruggles, Fitchburg, Mass. Dated Oct. 14th, 1862. Application for reissue received and filed, Jan. 8th, 1868.

What is claimed as the invention of Solomon W. Ruggles, is the combined use therein of power, multiplying toothed wheels, wrapping connected differential drums, or pulleys, and a sheave block, or blocks, substantially in the manner and for the respective purposes herein set forth.

25,823.—LIGHTNING ROD.—William Hall, Dubuque, Iowa. Dated Oct. 18th, 1859. Application for reissue received and filed Jan. 11th, 1868.

I claim as an article of manufacture a cylindrical lightning rod made of sheet copper in sections, when the sheet is made to extend beyond a single cylinder, leaving the edges open or unsoldered, when the same is constructed substantially as and for the purposes herein set forth.

56,581.—QUARTZ CRUSHER.—John Mabbs, Isle Royal Mines, Houghton, Mich. Dated July 24th, 1866. Application for reissue received and filed Jan. 11th, 1868.

I claim, 1st, The revolving feed table, J, in combination with a quartz crusher or pulverizer, whether connected by a sleeve to the main shaft, or revolved on a separate shaft, substantially as described.

2d, The plow or scraper, L, in combination with the feed table, J, when attached to the axle of the muller or fixed stationary, substantially as described.

3d, The tank, O, in combination with the plow, L, feed table, J, and mullers, F, constructed and operating substantially as and for the purpose described.

65,680.—CEMENT FOR FIXING DOOR KNOBS, ETC.—Patrick Kennedy, New York city. Dated June 11th, 1867. Application for reissue received and filed, Jan. 11th, 1868.

I claim the application of a cement which is composed of sand and alum, with or without the addition of copperas, for fastening door or furniture knob-tops to their metal or other shanks, as set forth.

72,209.—LAMP BURNER.—W. H. Love, R. H. Childs, and W. H. Childs (assignees by mesne assignments of John C. Love), Philadelphia, Pa. Dated Dec. 17th, 1867. Application for reissue received and filed, Jan. 15th, 1868.

We claim as the invention of the said J. C. Love, and desire to secure by Letters Patent,

1st, A flat slotted plate, d, arranged above the dome, B, of a lamp burner as and for the purpose described.

2d, The plate, d, with its flange, i, and opening, n, in combination with the casing, A, of a lamp burner, when the edges of the said casing are parallel to the upper edges of the wick tube, as set forth.

3d, A burner having a ledge, t, for the support of the chimney, when the said ledge is level with or above the top of the wick tube, for the purpose specified.

☞ NOTE.—*The above claims for Reissue are now pending before the Patent Office and will not be officially passed upon until the expiration of 30 days from the date of filing the application. All persons who desire to oppose the grant of any of these claims should make immediate application.* MUNN & CO., *Solicitors of Patents, 37 Park Row, N. Y.*

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Assets, 1st Jan., 1868.....3,623,896 78
Liabilities.....107,490 55

Fire and Inland Insurance.

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A. F. WILMARTH, Vice President.
J. H. WASHBURN, Secretary.
GEO. M. LYON, Ass't Secretary.
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Iron Founders and Manufacturers of Machinists' and Gun Tools, 54 to 60 Arch street, Hartford, Conn.
Samples may be seen in our Wareroom. 6 tf

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VARIABLE CUT-OFF STEAM ENGINE,
Regulated by the Governor. Sole Manufacturers in the United States of Westons's Patent
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Our machines we warrant. Send for descriptive pamphlet. Agents solicited. 6 7eow

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The large Gun Lathe made by the Putnam Machine Company for the Commonwealth of Massachusetts, with sundry other machinery and tools used in the manufacture of heavy ordnance.

The following is a description of the lathe and the machinery, etc., to be sold with it:—

Length of bed 40 feet 8 inches; swing over the slides, 6 feet 9 inches, with boring apparatus supported on three saddles; slide rest, 7 feet long, supported on two cross beams with longitudinal feed by means of an eccentric on a splined shaft and a connecting rod operating a ratchet and hand transverse feed. One extra tool post or poppet head. One saddle on a circle 41 inches in diameter. One ditto circle 19¼ inches diameter. One ditto circle 15 inches diameter. One boring arm 5 feet 6 inches long, 7 inches by 14 at one end, and 7 inches by 5¼ at the other. One fulcrum for boring arm to go on slide rest. Over head work, counter shaft boxes, cone and pulleys; four wrenches; one spare worm gear; one spare worm; two spare bevel feed gears; two steel centers to go into boring bar for dead centers—the whole weighing about 56,000 lbs.

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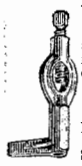

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From ⅜ to 2 inches, 8 sizes, inc.....$ 8 00
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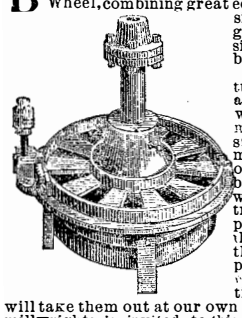

The undersigned manufacturers of the above wheel are prepared to furnish and warrant the same to give more power than any overshot or other turbine wheel made using the same amount of water. These wheels have been tested with all the wheels of note in the country, and have never failed to prove their superiority. We therefore propose to put them in for any responsible party, warranting them to work up to our representations, failing in which we will take them out at our own expense. The attention of millwrights is invited to this wheel. Agents wanted in every county in the United States and Canadas. Send for descriptive circular. J. H. BODINE & CO., 24 tf eow] Mount Morris, New York.

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Across the Continent,

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The remaining ten miles will be finished as soon as the weather permits the road-bed to be sufficiently packed to receive the rails. The work continues to be pushed forward in the rock cuttings on the western slope with unabated energy, and a much larger force will be employed during the current year than ever before. The prospect that the whole

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WILL BE COMPLETED IN 1870,

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CLARK, DODGE & CO., Bankers, No. 51 Wall st.
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New York, Jan. 8th, 1868. 5 tf

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CERTIFICATES:

Fairhaven, Vt., June 8th, 1867.

Joseph Harrison, Jr.,

Dear Sir:—We received your inquiries, asking how we liked your Boiler, etc. In reply, will say that we are much pleased with it, and as far as our experience goes, we believe it is all you recommend, and think we make a saving of at least one-third of the fuel over our old boiler, while it does our work much better. As to its safety, we made a good test some three months ago. The fireman went off duty, leaving the water low, and the next man came on late, seeing the water low and steam also down, he thought he would get steam up first and then put on the pump; but seeing the steam did not come up, we looked into the furnace and saw it was at a white heat. As it was very hot we let it cool off and then put on the pump, but the water leaked out as fast as it came in. We then screwed up the nuts on the bolts, and found the boiler as good as ever. It has been at work ever since, and works just as well as it did when first put in. Respectfully yours. T. & W. MILLER.

Peru, Ill., June. 25, 1867.

Joseph Harrison, Jr., Esq.,

Dear Sir:—Your favor of the 30th ult., asking my opinion of the 50 H. P. Boiler I bought of you, came safely to hand.

Allow me to say that I am very much pleased with the Boiler. I (who never saw a boiler set) superintended its erection, and a young, smart fellow, not 21 years of age, coupled it to the engine, and it has now its complement of water, and does not leak a drop. We had 70 lbs. of steam in 30 minutes, and the furnace had no fire in it for two weeks.

Allow me also to express my great admiration of the excellence of the workmanship in your Boiler and Fittings, and the very reasonable prices at which they are furnished. Yours truly, JAMES BARTON.

Portland, Me., July 19, 1867.

Joseph Harrison, Jr., Esq.,

Dear Sir:—After several months' constant use of the Harrison Boiler, it gives us great pleasure to state that we consider its good qualities cannot be equalled by any other Boiler we have ever seen.

From some severe tests, both before and after setting in operation, we are confident as to its entire safety from explosion, and we can cordially endorse all claims as to its facility for generating steam, and also the readiness with which it can be cleaned inside and out.

In economy of fuel it exceeds our most sanguine expectations, and we could make some statements thereto that might appear incredible where we were not known. We therefore prefer, and should take pleasure in exhibiting to parties interested a practical illustration of its superiority in this and other respects. Yours truly,

LEATHE & GORE,
Manufacturers of Steam Refined Soaps.

Camden, N. J., Dec. 20, 1867.

Mr. Joseph Harrison, Jr.,

Dear Sir:—In reply to yours, under date of Dec. 20, 1867, regarding the Harrison Boiler, we would say that, having used one for a year, we feel justified in saying that, for economy of fuel, safety, quick generation of steam, and other general advantages, with far less liability to become out of order, obtained by the use of the Harrison Boiler, we consider it a very profitable investment.

Very respectfully yours,
GARRISON, GILLINGHAM & CO.

Lebanon Furnace, Dec. 21, 1867.

Mr. Joseph Harrison, Jr.,

Dear Sir:—It gives me great pleasure to state that the boiler you furnished me for my repair shop has given me entire satisfaction. I can raise steam in a shorter time than in any boiler I have ever used. It has not leaked a drop since it was put up, and has not cost a cent for repairs. I feel that it is a very safe boiler, as I do not see how a dangerous explosion can take place. I believe it to be an economical boiler, though I have made no experiments with it as to the amount of coal consumed in work done. Yours truly,

G. DAWSON COLEMAN.

Office of Nashua Lock Company,
Nashua, N. H., Dec. 23, 1867.

Joseph Harrison, Jr.,

Dear Sir:—We have had one of your Harrison Boilers in our establishment since March last, and can say that for safety, nothing can surpass it; as you know, one section was dropped into the hold of the vessel, in shipping it, which has caused two of the Balls to break, both times when our steam was at 80 lbs., and no damage done. As to the economy of the Boiler, we cannot say too much in its favor, and as to its generating of steam, nothing, we think, was ever made to surpass it. Our boiler is 50-horse. we use 32 of it for our engine, and from the top of the boiler a 1½ pipe starts, and goes through 1800 feet of same size pipe into a Japan Oven, and the steam passing continually through it, and it never lacks for steam. We cannot speak too highly of all its merits. Yours truly,

F. O. MUNROE, Sup't N. L. Co.

New Britain, Conn., Dec. 24, 1867.

Jos. Harrison, Jr., Esq.,

Dear Sir:—Your letter was duly received; in reply will say we are very much pleased with the boiler we had of you last summer. We find it to be all you claim for it. We are convinced of its entire safety; and as for economy, we want no better proof than our engineer asking us for an increase of his wages, as he said he only used about one half of the fuel required for the other kind of boilers, to keep up the same amount of steam. We know of no other boiler by which steam can be got up as quickly with as little attention, and what we now know of the Harrison Boiler, we should prefer it to any other we have ever seen. Very respectfully yours,

JUDD & BLAKESLEE.

Office of Van Brunt & Co., Manufacturers of Agricultural Implements, Horicon, Wis., Dec. 25, 1867.

Jos. Harrison, Jr.,

Dear Sir:—Yours of the 20th inst., making inquiries as to the working of the Harrison Boiler, had of you, we have to say, that we have been well pleased with its power to generate steam, exceeding any other boiler we have ever used in economy of fuel and facilities of getting up steam. Yours, respectfully,

VAN BRUNT & CO.

Black Diamond Steel Works, Park, Brother & Co.,
Pittsburgh, Dec. 26, 1867.

Joseph Harrison, Jr.,

Dear Sir:—For some five months we have used your Boilers over two of our heating furnaces, using the steam from them to operate one of our three-ton hammers. The boilers will make more steam than we require, and consequently we have our heating furnaces provided with spare or additional stacks, so arranged that when the heat from the furnaces gives us more steam than wanted, we close the dampers of the furnaces on the rear stacks, and open those belonging to the forward stacks, thus preventing the waste heat from the furnaces from passing under and along the boilers. We believe your boilers are less liable to accidents than any other kind of steam generator now in use, and we would not substitute any other description of steam boiler in place of them, for the following reasons, viz:—We believe them to be the safest, most economical and durable boilers now offered to the public. Since the first day we fired up our heating furnaces, over which we have your boilers placed, we have not experienced the least trouble, and do not expect to have any trouble in the future. We therefore cheerfully recommend your boilers to the public. Respectfully yours,

PARK, BROTHER, & CO.

Almonte, C. W., Dec. 26, 1867.

Joseph Harrison, Jr.,

Dear Sir:—In reply to yours of the 20th, it gives us great pleasure to be able to bear testimony in favor of your Boiler on all points on which you ask our opinion—safety, economy in fuel, and general merit. We have now two of 75 horse-power each, and are very much pleased, indeed, that we did not put in tubulars, as we had at first intended. In reply to a letter of inquiry from another Canadian firm, we wrote this morning:—"Almost comfortable thing it is to be able to stand in front of a boiler and have no feeling of danger." Such is our experience, and we have no hesitation in recommending your Boiler to all in want of steam power. Yours truly,

B. & W. ROSAMOND & CO.,
Manufacturers of Woolens.

Alexandria, Va., Dec. 27. 1867.

J. Harrison, Jr., Esq.,

Sir:—We have had your Boiler in use about eight mos., and find that in economy of fuel, safety, and superior finish, it is all that was promised, and we are entirely satisfied with it. Very respectfully yours, etc.

J. G. VERPLANCK & CO.

Philadelphia, Dec. 27, 1867.

Mr. Joseph Harrison, Jr.,

Dear Sir:—in answer to yours of 20th instant, it gives us pleasure to state we are well satisfied with our Harrison Boiler, deeming it economical in fuel, easily managed, and have confidence in its exemption from destructive explosion. During the year it has been in use, our works have not been delayed one hour, nor have we discovered the least imperfection, either from leakage or any other cause. Having taken the precaution to secure sufficient capacity, we have ample steam and considerable to spare, burning a slow, moderate fire, with the steam damper (set at 45 lbs.,) closed most of the time.

Very respectfully, your friends,

HANCE, GRIFFITH & CO.

Galena Foundery, Galena, Ill., Jan. 6, 1868.

Joseph Harrison, Jr., Esq.,

Dear Sir:—It is with pleasure that I bear testimony to the merits of the Harrison Boiler. I have had your Boiler in use about one year, and it has given entire satisfaction. It has had the most severe tests, which would have ruined any ordinary boiler. It is very economical, and takes very little fuel to raise steam. We have raised steam to 40 lbs. in eight minutes, on Monday morning when the water was cold. In thirty years' experience with boilers in England and America, I have not found one to compare with the Harrison Boiler for safety and economy.

Yours truly, JOHN WESTWICK.

Phœnix Steam Mills,
Philadelphia, Jan. 10, 1868.

Jos. Harrison, Jr., Esq.,

Dear Sir:—I am in receipt of your favor asking my opinion of the Harrison Boilers, put up in the place of the boilers that exploded with me in January last, and which have been in constant use ever since. I find that they save me at least 25 per cent in fuel, are less liable to leak, and I consider them entirely safe, and prefer them in every respect to the old-fashioned boiler.

Yours, very respectfully,

JAMES M. PATTON,
Brown street Wharf.

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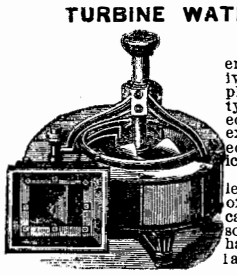

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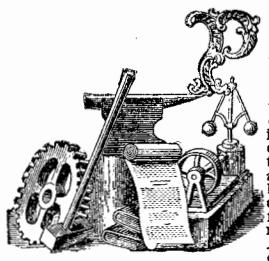

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